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# Vol. 30, January—December, 1918

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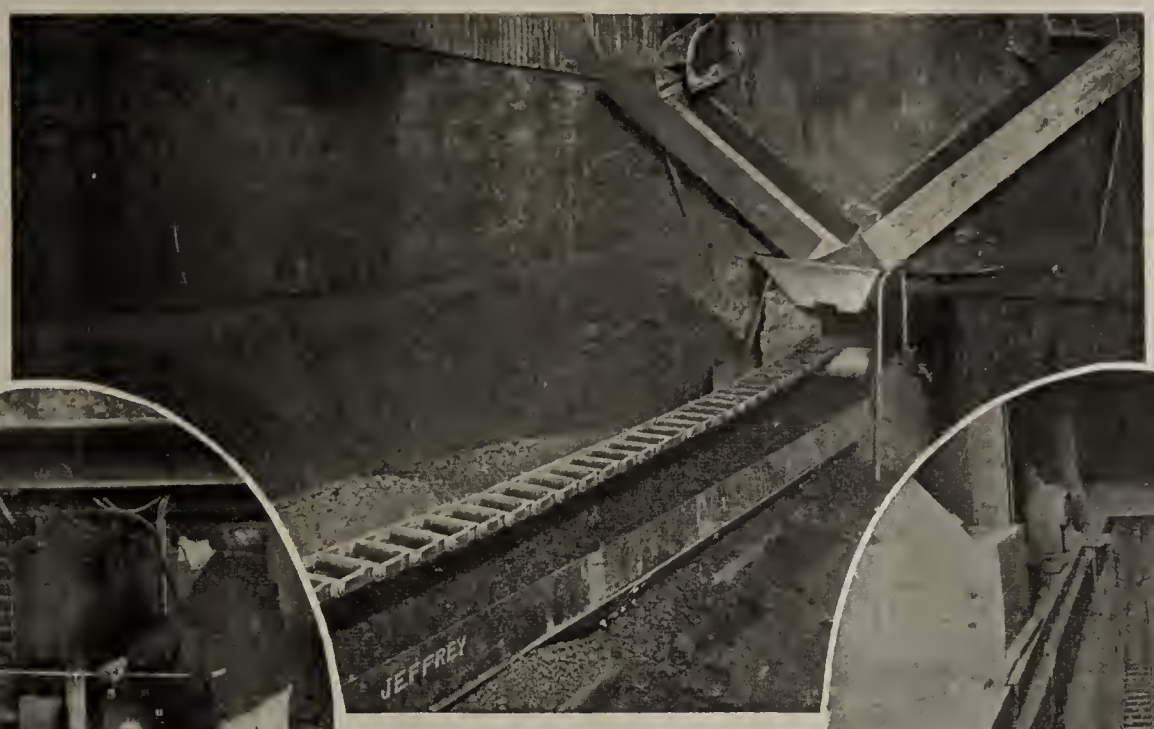
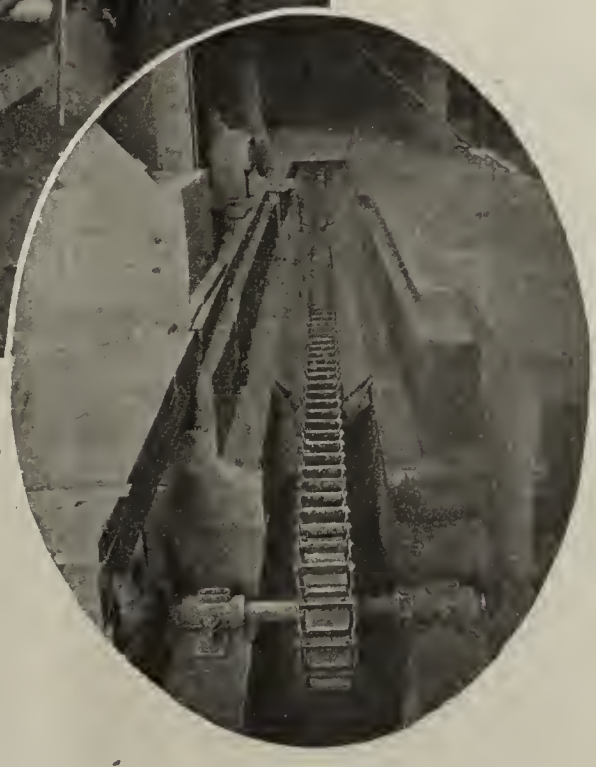



Installation Handling Cement Clinker

Jeffrey Reliance Drag Chain Conveyor handling ashes

# JEFFREY "RELIANCE" DRAG CHAINS



Jeffrey Reliance Drag Chain Conveyor for handling crushed stone

# These Are Low-Cost Conveyors for Loose Materials

The Reliance Drag Chain is one of the standard units for Jeffrey Conveyors, and is now extensively used for handling loose materials such as Cement, Clinker, Ashes, Broken Stone, etc.

It combines the advantages of large capacity with low first cost, simplicity and small maintenance expense. Conveyors operate in a steel trough—the conveyed material forming a cushion between chain and trough and keeps down the wear.

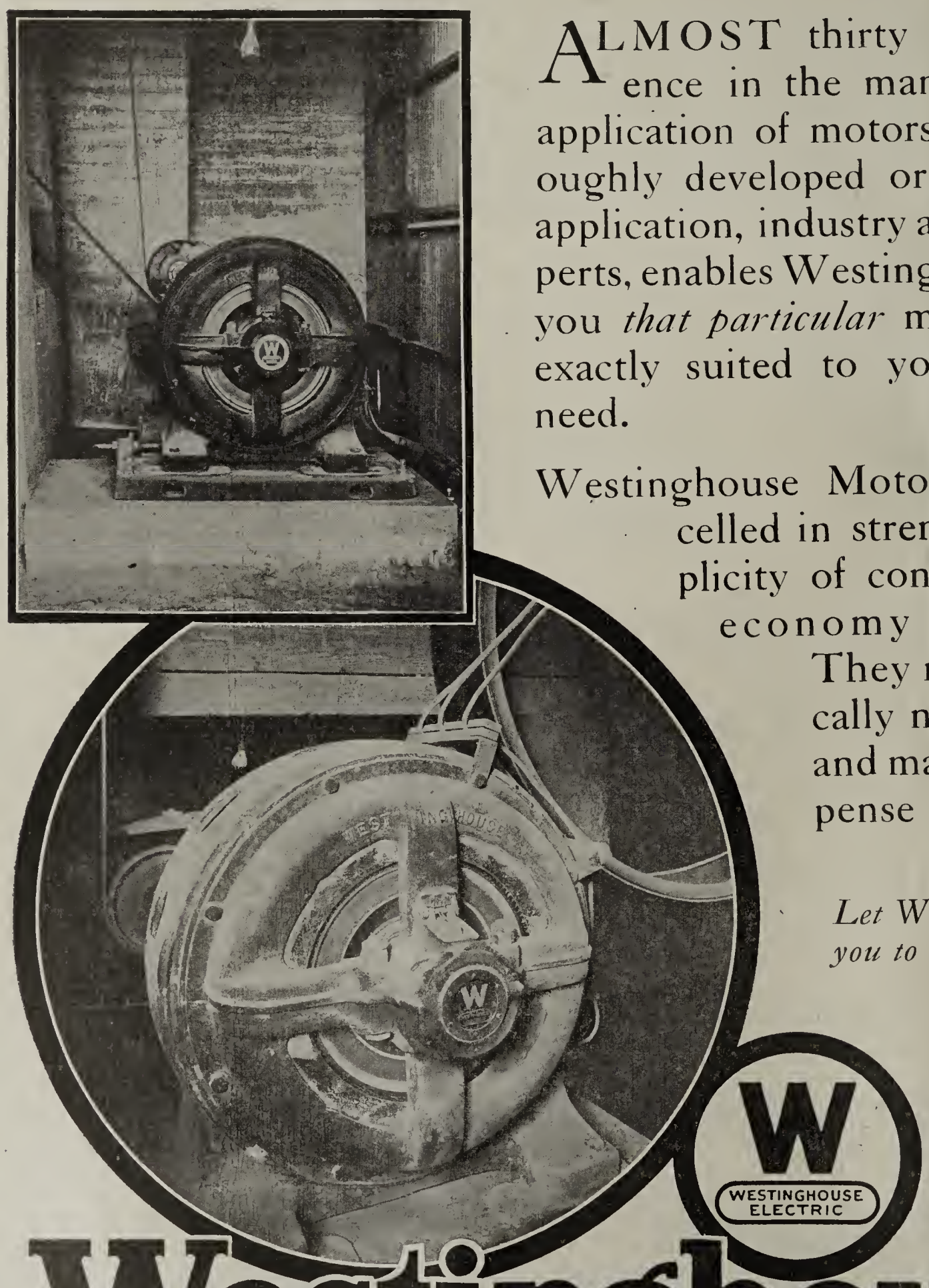
*Jeffrey Bulletin 161-14 gives the details of Drag Chain Conveyor construction and some interesting facts and pictures of installations. Write for a free copy now.*

## The Jeffrey Manufacturing Co.

**914 North Fourth Street** **Columbus, Ohio**

uare Shank Pin "Hercules" Chain for Heavy Elevator Service in handling gritty or abrasive materials.

# The Motor For Your Individual Need-



ALMOST thirty years' experience in the manufacture and application of motors, and a thoroughly developed organization of application, industry and design experts, enables Westinghouse to offer you *that particular* motor which is exactly suited to your individual need.

Westinghouse Motors are unexcelled in strength and simplicity of construction and economy of operation. They require practically no attendance, and maintenance expense is small.

*Let Westinghouse help you to better economies.*

**Westinghouse Electric & Manufacturing Company**

**East Pittsburgh, Pa.**

W WESTINGHOUSE ELECTRIC

# Westinghouse

# For Better Service in Mechanical Rubber Goods

THE United States Rubber Company, on January 1st, 1918, inaugurates an improved method of marketing in its *Mechanical Goods Division.*

This division includes Rubber Belting, Packing, Fire, Steam, Water, Garden and all other kinds of hose; Rubber Tiling, Mats, Matting, Jar Rings, Toys, Plumbers Supplies; Rubber Tape, Soles, Heels; Fibre Soles and hundreds of other rubber items.

Heretofore these goods have been marketed through subsidiary companies that for years have served all classes of industries, railroads, etc. These subsidiaries include

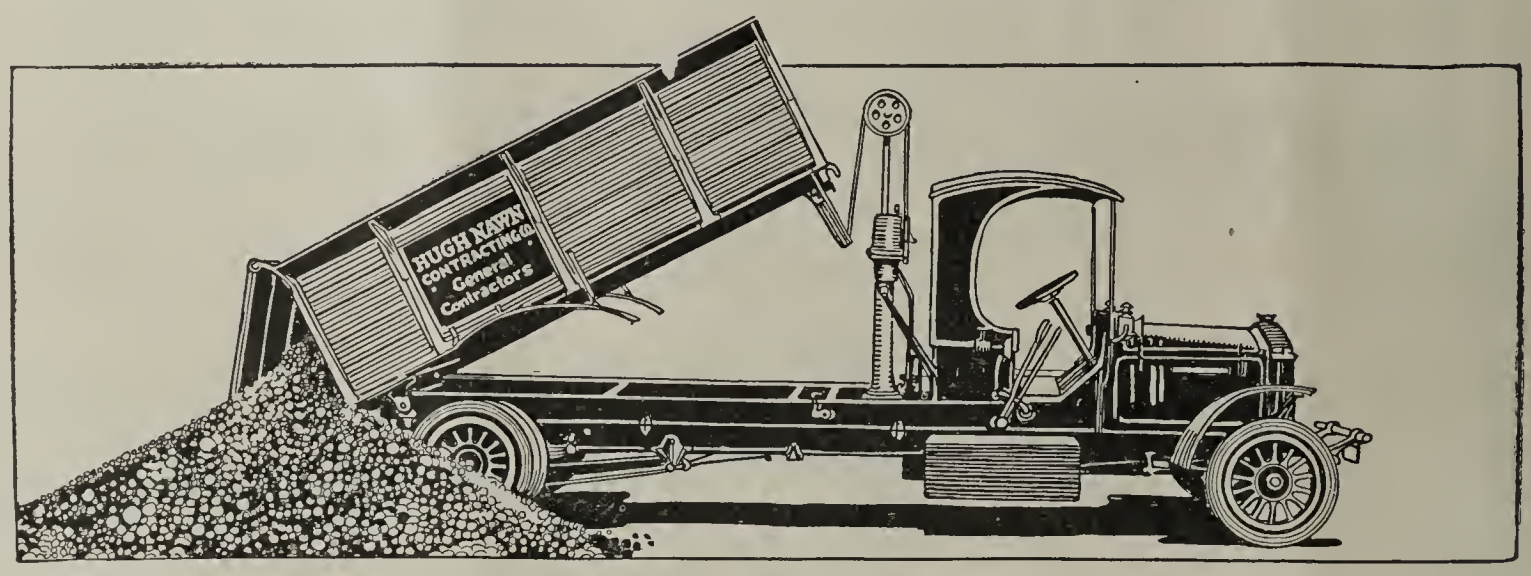
**Revere Rubber Co.**
**Peerless Rubber Mfg. Co.**
**Mechanical Rubber Co., Cleveland**
**Mechanical Rubber Co., Chicago**
**Sawyer Belting Co.**
**India Rubber Co.**
**Eureka Fire Hose Mfg. Co.**

This plan will centralize the distribution of all these companies in one organization having branches and agents all over the country. This means quicker and better service everywhere for users of mechanical rubber goods.

The subsidiaries will continue to manufacture the brands, such as Sawyer Belting, Rainbow Packing, etc., etc., for which they are famous. The same high standard of quality and workmanship will be maintained. In addition the great seal of the United States Rubber Company, the hall mark of quality and value in rubber goods, will identify these goods.

The assembling of all these well known brands in one selling organization makes the most complete line of mechanical rubber goods in the world. With distributors everywhere and factories in the large centers east and west we assure our customers the maximum in service and quality.

# United States Rubber Company




# Hugh Nawn compares year's operating costs for two well-known makes of Motor Trucks

Hugh Nawn, the Boston contractor, long ago realized that motor trucks are the most efficient and economical hauling units for large operations. The only question in his mind was which is the best truck.

His choice finally narrowed down to two well-known makes, one the Pierce-Arrow, the other a competitive truck of high reputation. For one year these trucks were kept on similar jobs, both operating under the same accurate system of cost accounting. Neither truck was spared, and the severity of service in rush work is shown by the high tire cost for both trucks. As a result of the comparative showing tabulated below, Mr. Nawn is satisfied that the Pierce-Arrow is the best truck made for contracting business.

| COMPETITIVE TRUCK'S RECORD | | PIERCE-ARROW TRUCK'S RECORD |
|---|---|---|
| Miles Run | 13,095 | 15,517 Miles Run |
| Tonnage hauled | 10,768 | 11,013 Tonnage hauled |
| Gallons of gasoline consumed | 4,521 | 4,389 Gallons gasoline consumed |
| Pints of oil consumed | 1,176 | 385 Pints of oil consumed |
| Repairs to motor | $740.37 | $136.16 Repairs to motor |
| Labor repair cost | 249.25 | 152.91 Labor repair cost |
| Tire cost | 888.79 | 841.78 Tire cost |
| Year's operating cost excluding insurance, depreciation etc. | 3,520.27 | 2,768.96 Year's operating cost excluding insurance, depreciation etc. |
| Average operating cost per day including overhead | 19.80 | 16.78 Average operating cost per day including overhead |

A number of other interesting installations are shown in our booklet, "What Pierce-Arrow Motor Trucks Are Doing In The Contracting Business." We shall be glad to send you a copy.

THE PIERCE-ARROW MOTOR CAR CO., BUFFALO, N. Y.

# PIERCE-ARROW

*Motor Trucks*

# GOODRICH

# "LONGLIFE"

# CONVEYOR BELTS

## Everything Considered—

are by far the most economical belts you can buy today in the World's markets—and the most satisfying in service. We have the proofs.

"Longlife" is not only the best Conveyor Belt made today anywhere—none barred—but the best known.

You can have it in any width, ply or length. Every tough, gristly, muscular inch of it is backed by a powerful organization, anxious to see it give you a better service than you have ever received from any other Conveyor Belt.

**THE B.F. GOODRICH COMPANY**

Makers of the Celebrated Goodrich Automobile Tires—*"Best in the Long Run*

Branches and Distributors in All Districts

Factories: AKRON, OHIO

TRADE MARK

# Symons Disc Crushers

***Mr. John Rice, Prest., The General Crushed Stone Co., Easton, Pa., says:—"We have three Symons Disc Crushers, the first one having been put into service some three to five years ago, and we find them quite satisfactory for general commercial purposes in that they are somewhat more elastic in the variation of sizes than some other types of machines. We, of course, use them only for handling rejections or larger sizes of stone which it is our desire to reduce to somewhat smaller sizes. They are all 48-inch crushers and we are quite well satisfied with them."***

Not only does the Symons Disc Crusher turn out a clean, uniform product with great rapidity, but it keeps everlastingly at work—delays are reduced to a minimum and repair costs unusually low. Because the discs (manganese crushing members) revolve in the same direction the Symons Disc Crushers conserve momentum and require less power to operate.

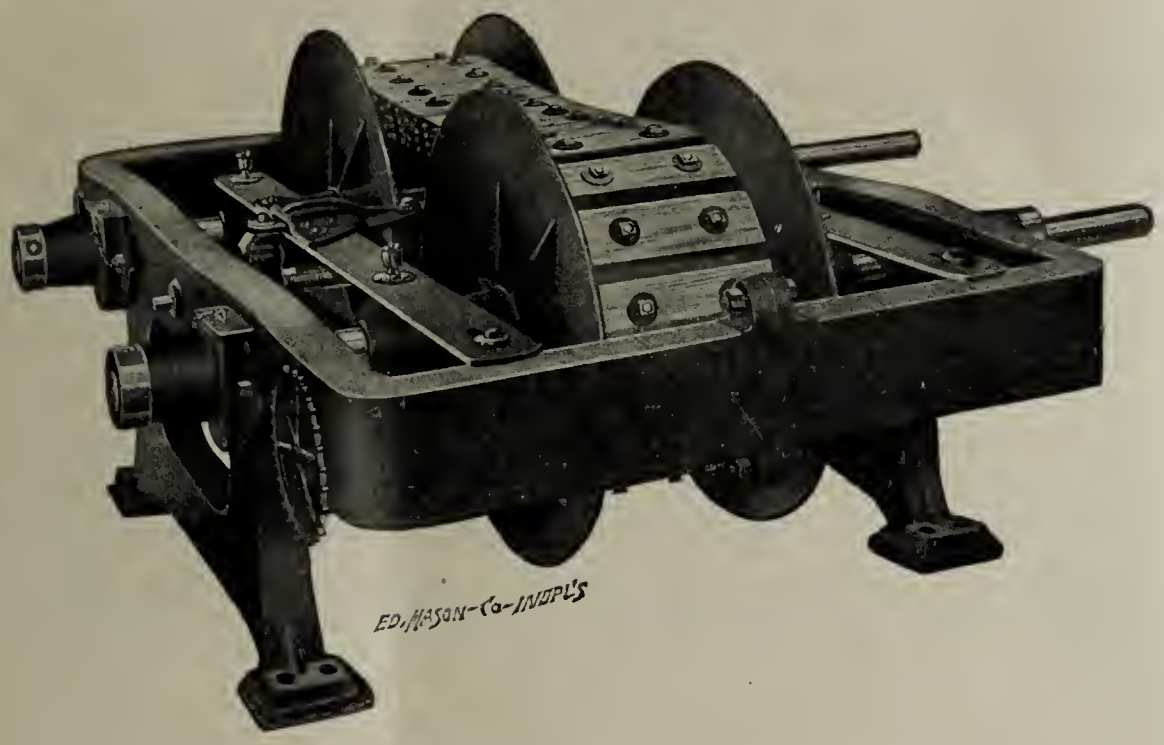
Equip your Crushed Stone or Gravel Plant with the Symons Disc Crusher—it will increase your output—lower your costs and deliver a more uniform product.

Made in several sizes—each crusher adjustable to turn out crushed material of various sizes. Investigate the many advantages of the Disc Crusher Principle. Send for Catalog and information.

Sold only by

**CHALMERS & WILLIAMS CO.,**

**CHICAGO HEIGHTS, ILL.**




# "The Reeves" Variable Speed Transmission

## THE ONLY SOLUTION OF YOUR SPEED CHANGING PROBLEMS

It's a pretty stiff speed problem you're up against when you try to change the speed of your cement kiln or coal feeder. Especially so when you want a range of from 2 to 1 up to 10 to 1.

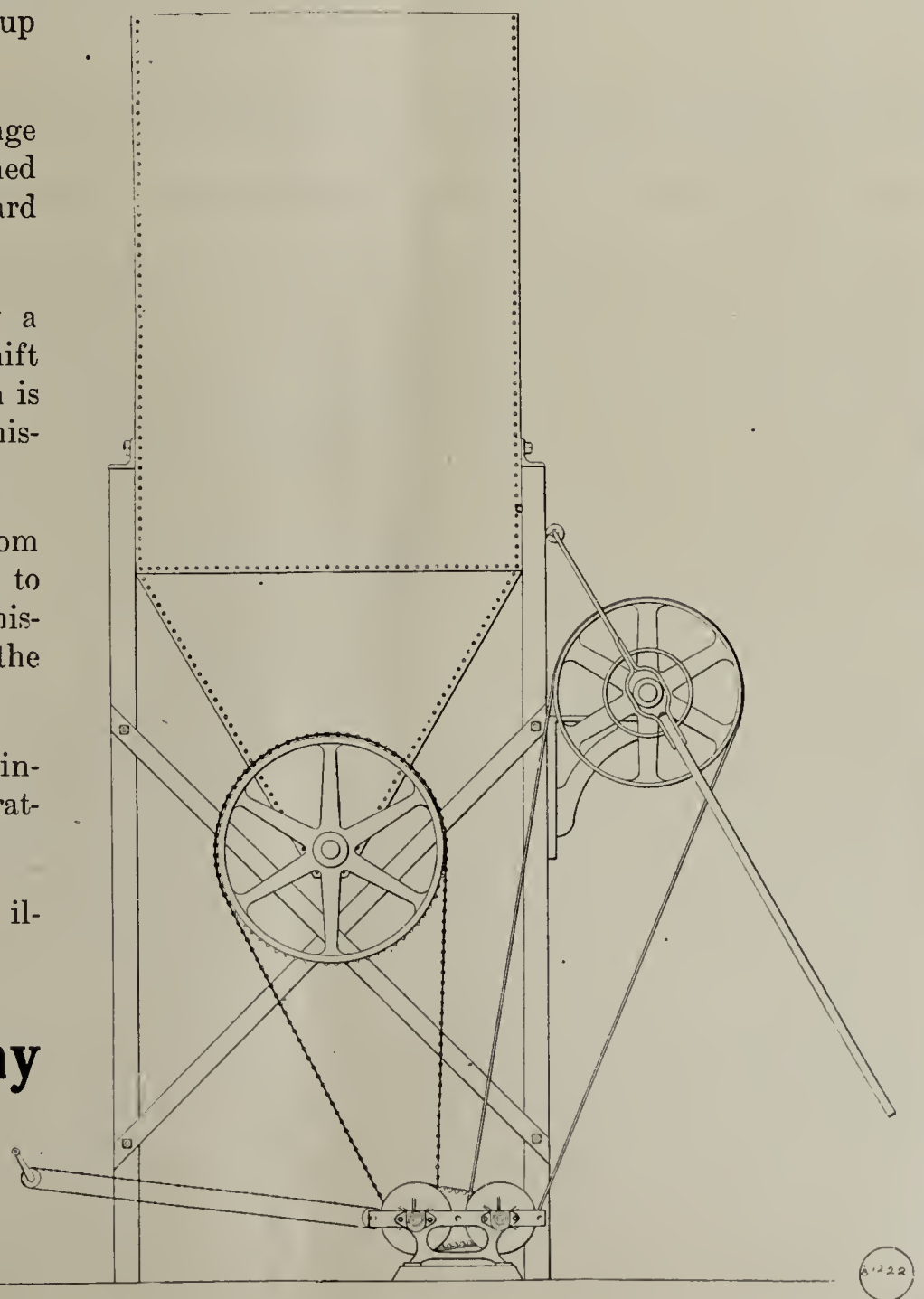
However, do you know that this speed change is not only possible, but is easily accomplished with "The Reeves" Transmission—the standard speed changing device.

The Transmission is operated simply by a hand wheel; there are no belts or gears to shift or tamper with. This simplicity of operation is one of the features which make the Transmission very popular with cement mill owners.

Just recently we received a large order from Japan for several large size Transmissions to operate a 9′ x 200′ rotary kiln. The Transmissions will be used to regulate the speeds of the kiln, coal injector and raw material feeder.

The illustration opposite shows a typical installation of "The Reeves" Transmission operating a coal feeder.

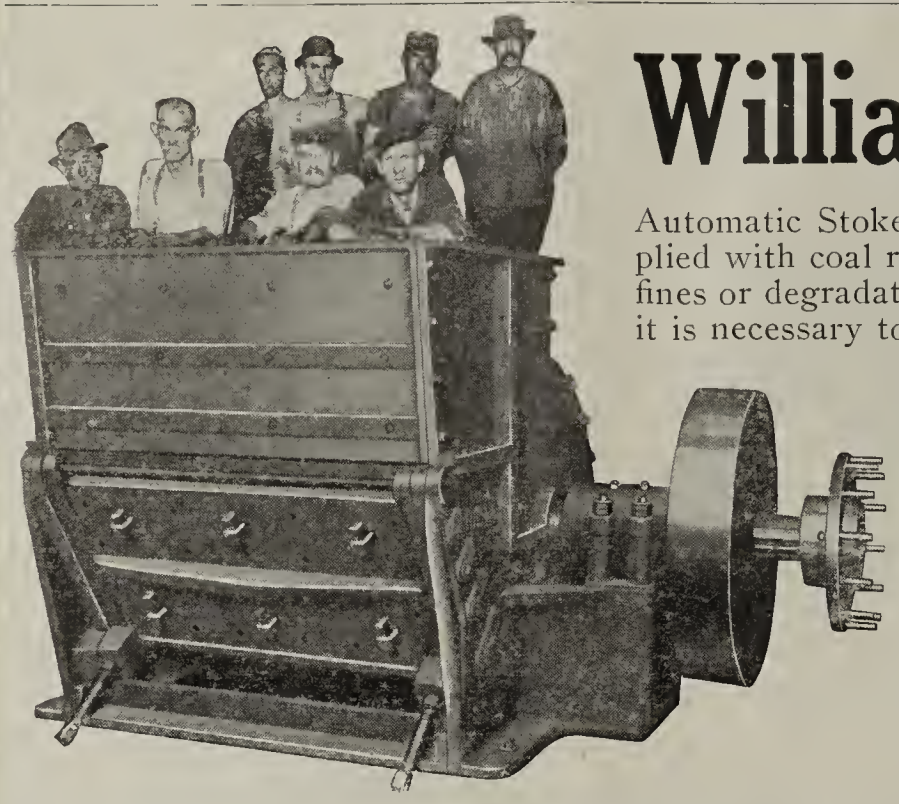
For further particulars write for our illustrated catalog, T-16.



## Reeves Pulley Company

### Columbus, Indiana

Chicago Branch:
Cor. Clinton and Monroe Sts.



# Williams Coal Crushers

Automatic Stokers and Chain Grates give the best results when supplied with coal ranging from 1½" down to ¾", with the minimum of fines or degradation. These sizes, however, are difficult to secure, and it is necessary to purchase instead, run of mine and lump sizes. This again makes it necessary for the consumer of coal to crush these sizes down to such size as will give best results on chain grates and stokers.

For this work the Williams Crushers are unexcelled, hundreds of Williams crushers are dong this work every day, crushing thousands of tons of run of mine and lump coal to stoker sizes. For this work Williams crushers are equipped so that the resulting product will be free from fines or degradation as far as it is possible to control degradation.

Paramount reasons why Williams Crushers should be used for this work are, that Williams Crushers are adaptable to all conditions, they are also adjustable to most every size of crushing; one machine often being used for crushing anywhere from 3" to ⅜" at the will of the operator. In addition they are accessible, making renewal of parts or inspection of internal mechanism easy. They are also provided with a Metal trap which gathers in a pocket all stray iron, thus preventing damage to the crusher, a feature not found in any other crusher. Further, Williams Crushers are reliable, as has been demonstrated during the last 22 years, the first Williams Crusher installed being still in active service. Complete information, such as description, specifications, illustrations, etc., will be found in

***BULLETIN No. 17-35***

## THE WILLIAMS PATENT CRUSHER & PULVERIZER COMPANY

**General Sales Dept.— 37 West Van Buren Street**

**CHICAGO**

**Plant**
**ST. LOUIS**

**67 Second St.**
**SAN FRANCISCO**

Crushing Plant of the Oklahoma Portland Cement Co., Ada, Oklahoma.

When this Company installed the Traylor 36x72 in. Type C Jaw Crusher, they eliminated unnecessary waste of POWER, LABOR and COSTLY SHUTDOWNS for reasons fully described in Bulletin J1—GET IT.

## TRAYLOR ENGINEERING & MFG. CO.

New York Office: 30 CHURCH ST.
Main Office and Works: ALLENTOWN, PA.
Western Office: SALT LAKE CITY

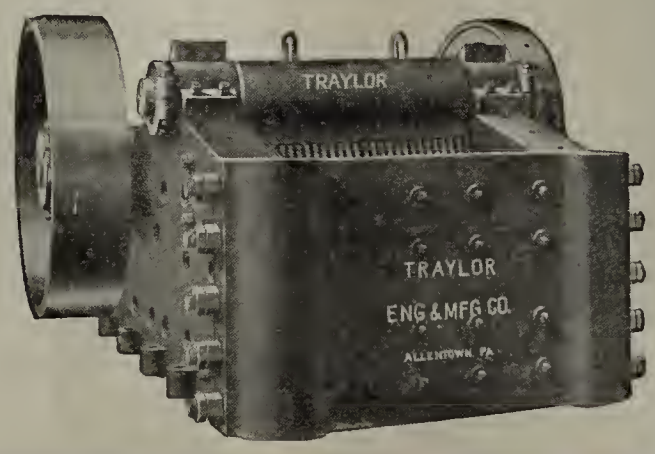
Chicago Office: 1414 FISHER BLDG.

# "IT'S A BEAR"

FOR CRUSHING HUGE PIECES OF STONE WITH EASE AND MINIMUM POWER CONSUMPTION

**THAT'S THE**

# TRAYLOR "TYPE C" Jaw Crusher



The illustration above shows the No. 5 on an ordinary foundation job. In the cut below we show it handling street repair work for the city of Cincinnati.

Mr. Thompson who put in 50 foundations with this mixer last year says: *"The No. 5 is the handiest mixer for foundation work I have ever used."*

The foreman of the street repair crew says: *"I cut down my force by five men after putting the No. 5 on the job, and got out more work than we did before."*

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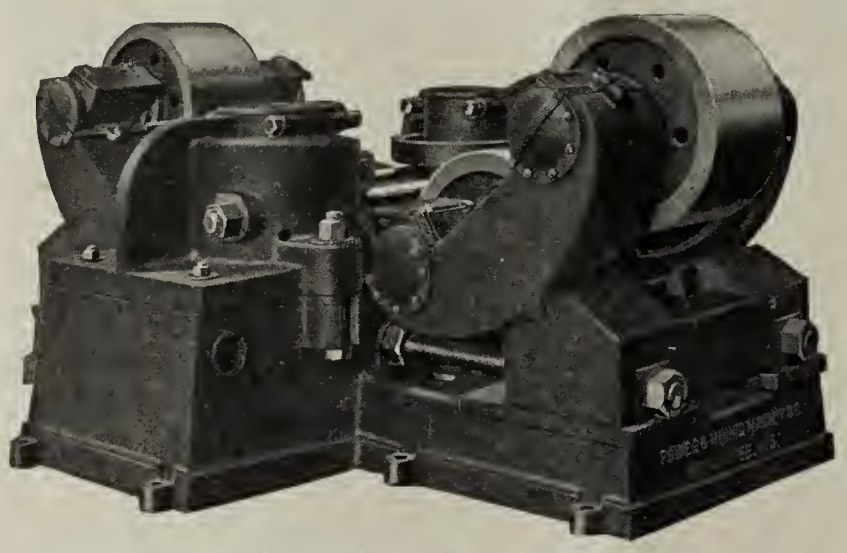

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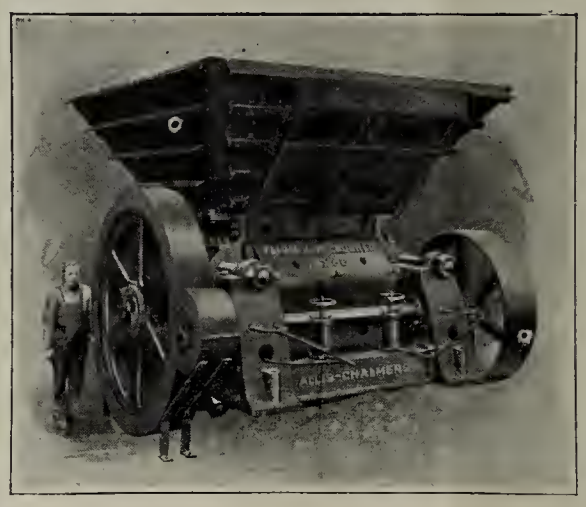

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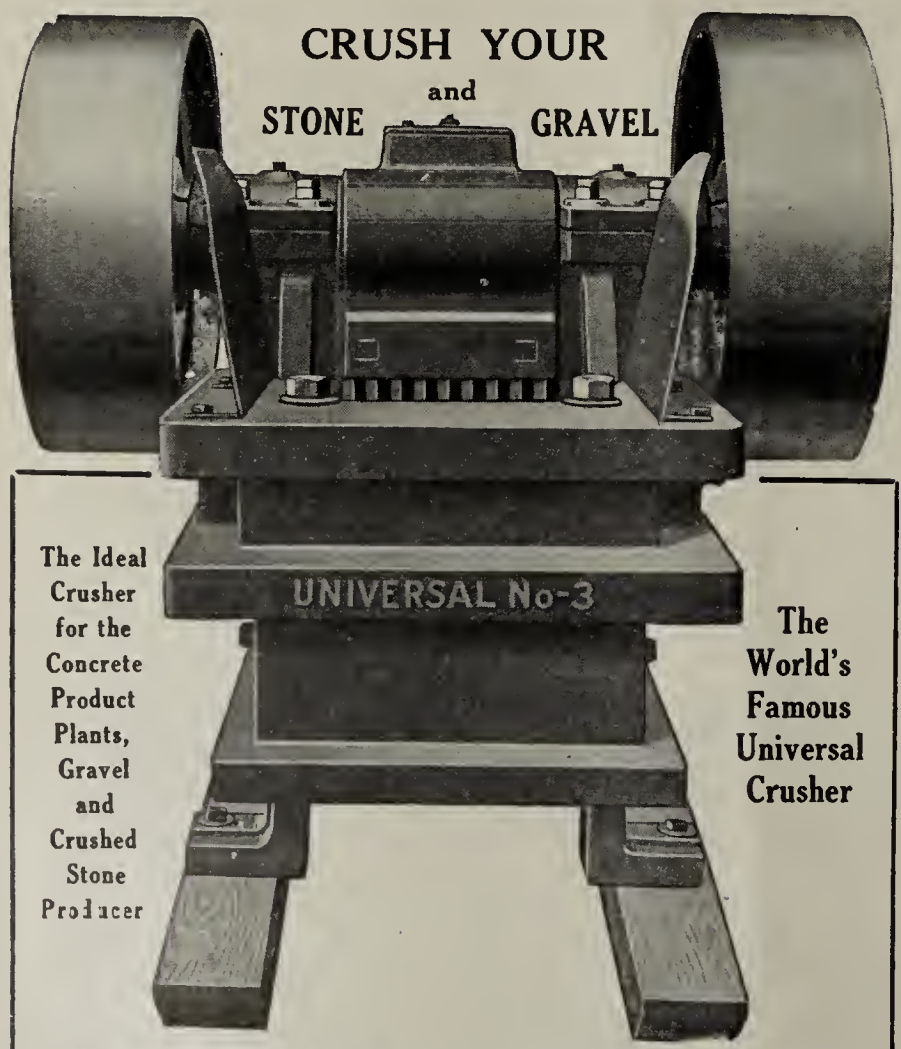


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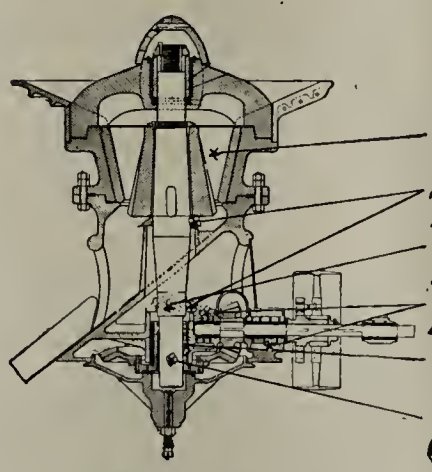

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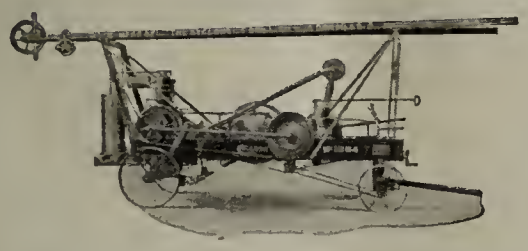

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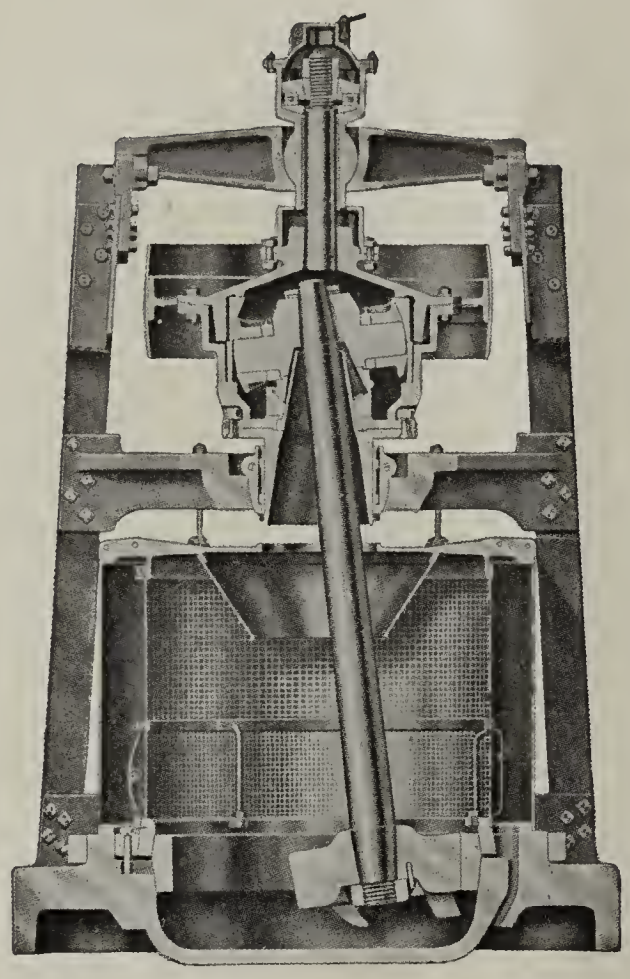

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# Cement and Engineering News

Vol. 30 January 1918 No. 1

Ornamental Concrete Structure Erected Around Steel Water Stand Pipes (See page 24)

# CEMENT AND ENGINEERING NEWS

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CHICAGO, JANUARY, 1918


# How Shall the War Highways Be Determined?

Chambers of commerce, boards of trade and local associations of manufacturers throughout the country can be of material help in relieving transportation congestion by furnishing to the highway departments of their respective states data as to the highways which can be most useful as substitutes for congested railway routes. This can be done by calling meetings of the traffic managers of the industries and having them, through a committee, determine the public roads whose maintenance and improvement is most important.

Such a procedure would be in conformity with plans formulated by the American Association of State Highway Officials at a meeting in Richmond December 4, and now endorsed in effect by the Office of Public Roads. The plan provides for the preparation of a program for the improvement and maintenance, in the order of their importance, of the highways which are of greatest economic value in the present crisis. Should shortage of materials and labor require priority ruling on all highway work, the program would then be presented to the authorities at Washington as a basis for national approval and authorization of work on the essential routes. Should no priority ruling interfere, the plan would nevertheless insure to the committee the expenditure of funds where it will be of the greatest benefit to the industries and people of the state.

Concerning this subject, Engineering News-Record will say this week:

Evidently if the information is to be secured at maximum speed, it is necessary to call upon those who are constantly dealing with transportation matters and who, therefore, are informed regarding the relative congestion and importance of various routes. Manifestly, these are the traffic managers of the various industries and the railroads themselves. Before the war it would have been futile to ask the railroads to supply such information. Now, they eagerly welcome any agency which can help them out of their difficulties.

To secure the help of the traffic managers of the industries, the chambers of commerce, boards of trade and manufacturers' associations throughout the country can be of tremendous assistance. They are organized for work among the manufacturers of their respective communities and can at once secure immediate attention and action. They have the organization machinery for just such work. Moreover, they are seeking opportunities to serve the nation. The call of the state highway department would meet with a ready response. A meeting of traffic experts in each sizable community, working through a committee selected by themselves, could in a very short time report back to the state highway departments the routes whose maintenance or improvement can in that particular district be of greatest service in relieving transportation difficulties. We know of no other agency which can mobilize for action so quickly.

More effective action from these bodies, of course, will be secured if the state highway departments themselves present clearly, as a basis for the activities of the traffic experts, some fundamental ideas regarding highway and motor-truck traffic. Fortunately these were well brought out at the Richmond convention and are pretty distinct in the minds of the heads of each state highway department. Obviously, the highway is of best service for relatively short hauls—60 to 80 miles. It is most economical when the trucks are loaded in both directions. Here again the interest of chambers of commerce and manufacturers' associations will be of very great value, because they are in a position to establish such committees or bureaus as will insure loaded traffic both ways. What that traffic will be will depend, of course, on local conditions. In one case finished products will be carried out, and raw materials in. In other cases, industrial traffic in one direction will be supplemented by foodstuffs in another.

In any event, the initiative and brains that will be brought together by the commercial associations in mobilizing the traffic information in their respective centers will not only produce the information needed to map out a highway war program for the district, but will result as well in ideas for conducting highway transport with the greatest economy.

We, therefore, commend to the consideration of the various state highway departments the plan of calling upon the dominant commercial bodies in the cities of their respective states for assistance in gathering the data for the highway war plan. That they will receive a prompt and effective response is certain.

As regards the very important matter of maintenance it may be noted that the state highway departments may obtain assistance from the state councils of defense, which have been asked to look after the maintenance of routes to the seaboard and to keep the Lincoln Highway open.

# Cement Testing

Cement-testing work formerly done by the United States Reclamation Service has been taken over by the United States Bureau of Standards.

Reinforced concrete ships are soon to be built by a firm of San Francisco engineers. It is stated that the plans call for a vessel 330 feet long, with a 44-foot beam, and a depth of 31 feet. Several concrete barges have been built at different times for use at the Panama Canal, Chesapeake bay, and in Norway. They have given good service and there is every reason to suppose that larger vessels could be constructed that would also be satisfactory.

# *Concrete Bridge in Bridegport, Conn.*

## Cast-Stone Work, Immitating Granite — By H. Maring

A study of the types of bridges used in the past shows that the art of bridge-building has developed as new materials have become available.

The first were the wooden pile bent bridges, and the wood trusses, which were succeeded by the combination trusses and wrought iron construction.

Then followed a long period in which steel bridges were used to a great extent, and more recently concrete bridges have taken the place of steel construction.

The recent great advance in the price of steel has resulted in an increased demand for concrete bridges, as the comparison of first cost of steel and concrete construction is very favorable to the latter. However, there is still room for improvement in the construction of concrete bridges, for the present types are so heavy, that in even as short a span as twenty-three foot and

**Beautiful Concrete Bridge in Bridgeport, Conn.**

**Cast-Stone Concrete Operating and Comfort Houses on the Bridgeport Bridge**

of modern design the bending moment, due to the dead load, figures seventy per cent of the total bending moment.

As an example of a concrete bridge, which is as nearly perfect as modern science enables us to build, I mention the Stratford Avenue Bridge in Bridgeport, Conn., which undoubtedly is one of the most artistic concrete structures in the country.

It is approximately 550 ft. long (comprising 135 ft. of roller lift bridge and seven flat arches of 40 ft, span) and 80 ft. wide. The north half of the bridge has been opened to traffic.

All the railing and ornamental work of this bridge including the two operating houses and two comfort houses; panel posts, end piers and pylons are made of cast-stone concrete. The concrete consists of a 1 : 2½ : 5 mixture and a 2-inch granite mortar facing of a 1 part Alpha Portland Cement, 2½ parts crushed granite stone and 1/10 black diamond grit, mixed with Impervite waterproofing.

This facing mixture is placed wet in wooden forms or plaster moulds at the same time with the ordinary concrete.

After the cast-stone has set, the surface receives a machine-crandaling finish, which brings out the granite effect so perfectly that it is almost impossible to distinguish it from natural granite.

From an architectural point of view, this bridge is artistically beautiful, and as it is only one block from the N. Y. New Haven & Hartford R. R. station, has been favorably commented upon by the traveling public.

In every respect the new bridge is far superior to any other in this part of Connecticut. Not only is it one of the very largest, but it is also one of the most beautiful in design and decidedly serviceable in every detail.

The bridge is built of steel and reinforced concrete.

The concrete is not the ordinary cement surface concrete, but is of the very latest type of cast-stone made by the Concrete Building and Construction Co. of So. Norwalk, Conn.

The simple dignified lines of the structure are to be credited to Grainert & Whitman, Consulting Engineers, of Baltimore, who have designed and built more bridges than almost any other construction company in the country.

The Stratford Ave. Bridge is a good example of high class reinforced concrete construction and a monument to the skill of the builders, the Holbrook, Cabot & Rollins Corp., Boston, and of the Concrete Building & Construction Co. of So. Norwalk, Conn., who did the ornamental work of cast-stone granite imitation. The plans of the designers were ably executed by the supervising engineers, F. C. Wolfe and McKenna of Bridgeport, Conn.

**Latest Type Artistically Beautiful Cast-Stone Concrete Used in This Bridge**

# *Largest Concrete Building Now Under Construction at St. Louis*

**Concrete on Largest Concrete Building Is Forced Through Chu tes Nearly 600 Feet Long**

The new plant in which the Anheuser-Busch Brewing Association will bottle and ship its non-alcoholic beer, known as Bevo, will be the largest reinforced-concrete building ever built, so far as available records go. It occupies an entire block near the St. Louis, Mo., river front, 542 ft. 9 in. on one side, 601 ft. 10 in. on the opposite parallel side and 252 ft. in the other direction. There will be eight stories above grade, the upper three of which form two balconies, and there is a 26-ft. receiving and shipping story below grade. The total floor area for the seven stories and two balconies is 1,078,012 sq. ft., or 24.75 acres. The cubic contents of the building and of a subway leading to it is 21,335,000 cu. ft.

This is slightly smaller in acreage but larger in cubage than Buildings 19 and 20 of the Bush Terminal group in Brooklyn, N. Y., which has hitherto been considered the largest concrete building. However, the Bevo building is far ahead of the Bush unit in its material content, which will total 8600 tons of reinforcing steel and 75,000 cu. yd. of concrete.

The building is to be used for the bottling and shipping of the beverage, which is brewed in an adjoining building and pumped to large tanks on the upper floors. The complications of machinery and the presence of 13 loading tracks running into the basement were the governing features of design; the former having its effect on the loadings and hence on the layout and member design, the latter requiring a very high basement story and a long viaduct carrying the marginal street over the tracks entering the building.

Before the final system of design was adopted, an exhaustive study of the various floor systems in general use was made, for the purpose of ascertaining the most economical construction consistent with the arrangement of machinery units, established requirements, floor loads, etc. The fixed arrangement of machinery units and floor openings for conveyors, chutes, escalators, stairs, etc., proved to be the dominant features in controlling the nature of system finally employed throughout the construction. The sizes of machinery units determined the spacing of all columns, which are spaced uniformly with few exceptions, 25 ft. c. to c. north and south and 16 ft. 6 in. c. to c. east and west. The floor system consists of two intermediate beams 5 ft. 6 in. c. to c. in each panel, spanning 25 ft. and supported by girders between columns.

All floors, with the exception of the fifth and sixth and the upper balcony, are designed for a uniformly distributed live-load of 275 lb. per sq. ft. A portion of the fifth floor is designed to support pasteurizers and tanks, the former weighing 125,000 lb. and the latter, 10 ft. 6 in. in diameter, weighing 75,000 lb. each. The load on a large portion of the sixth floor consists of a series of machines each weighing 130,000 lb. A large portion of the upper balcony is designed to support tanks averaging about 500 lb. per sq. ft. of floor.

The typical interior beams, continuous at both ends and spaced 5 ft. 6 in. c. to c. with 25-ft. spans supporting a 5-in. slab and 275 lb. uniformly distributed live-load, are 13 in. wide by 26 in. deep. Reinforcement consists of two 1-in. rounds and two 1⅛-in. rounds,

one-half the steel area being bent up at angles of 45° near the supports to provide for diagonal tension and negative moments. All diagonal tension in excess of 40 lb. per sq. in. is resisted by bars bent up at 45°. Stirrups consisting of ⅜-in. rounds bent in U-shape, spaced at intervals increasing toward the center, are employed primarily to assist in making the mass a more homogeneous unit, without accepting the generally adopted assumption that vertical U-stirrups serve as a medium of resistance to diagonal tension.

The typical continuous girders, spanning 16 ft. 6 in., are 18 in. wide by 30 in. deep and are reinforced with four 1-in. round straight and two 1-in. round and two ⅞-in. round bent rods. The latter are bent up at points beginning at concentrated loads. The ⅜-in. stirrups are spaced 6 in. c. to c. at ends and 18 in. between concentrated loads. In this instance, as in the case of beams, the bent-up rods and additional rods at supports are employed to resist all diagonal tension.

The intensity of varying stresses in all members were established by moment diagrams according to method adopted by Prof. Emil Morsch, by first considering the member fully loaded with adjacent member unloaded and then with loading condition reversed. This method establishes accurately the points of maximum and minimum positive and negative moments throughout the length of the members, permitting a more accurate distribution of the steel.

In a building of this length the question of providing for expansion and contraction was given much study. The many contradictory opinions on this subject made it one of particular concern to the designers of this structure, with the result that two joints were adopted, separating the length of structure into three separate units. The joint, 1½ in. wide in each case, is located on the center line between east and west columns, the floor construction being supported by cantilever floor-beams spaced 5 ft. 6 in. c. to c.

The joints were located in this manner to avoid any possibility of frictional resistance, which has so often proved a detriment in other structures when sliding plate or roller bearing joints failed to fulfill the assumptions of the designers. Twin columns separated by joints were considered undesirable and awkward in appearance. At the time of writing this description, observation showed that the joints had lessened in width a maximum of ¼ in. from the original measurement of 1½ inches.

All interior columns of the building are round and reinforced with hooping. They vary from 40 in. in diameter in lower story to 26 in. and 24 in. in the upper two stories. In order to facilitate the design and ordering of steel bars, all columns in the lower stories were designed for identical loads, assuming the maximum condition of machinery weights on fifth and sixth floors as well as the omission of many columns in sixth story. The final distribution of machinery and column omissions were not fixed at this stage of the design, which accounts for maximum assumptions made in computations. The lower-story columns are designed for a total dead- and live-load of 1,500,000 lb., being 40 in. in diameter and reinforced with twenty-six 1¼-in. round longitudinals and $\frac{9}{16}$-in. round spirals with 2-in. pitch.

Considère's formula was assumed as a basis for column design, stressing the concrete core to 750 lb. per sq. in., and assuming a modulus of 15.

All exterior columns are square, varying from 33 x 33 in. in the first story to 21 x 21 in. in the upper stories. The lower- or basement-story portion of exterior columns forms an integral part of retaining walls on four sides of building, with the exception of columns along the side opposite the viaduct. All splices of columns longitudinals are secured together by ½-in. U-bolts.

The retaining walls on four street fronts are 30 ft. high, 3 ft. 5 in. and 4 ft. thick, with base 11 ft. wide and 3 ft. deep. They were designed strictly as retaining walls to resist earth pressure, without assuming any lateral resistance offered by the first-floor construction. This method of procedure in design was adopted on account of the unusual depth of story below street grade. Before any other excavation was done, deep trenches approximately 12 ft. wide were dug to solid rock for the reception of the retaining-wall footings. The erection of retaining walls at the beginning of operation for the purpose of holding earth banks intact proved a great advantage in permitting the excavating for lower story to proceed almost simultaneously without interruption and with dispatch.

The expansion joints of the building are extended continuously through the retaining walls to rock foundations. All interior as well as exterior columns are supported on concrete pedestals 7 ft. square extending without exception to solid rock.

The roof over the balcony openings is of sawtooth construction, consisting of a series of reinforced-concrete girders 25 ft. c. to c. and spanning 49 ft. 6 in. between center lines of column supports. These girders are unsymmetrical in section, 48 in. deep and 24 in. wide. The girders continuous at both ends are reinforced with seventeen 1⅛-in. round rods. On account of the excessive lengths of rods that would be necessary to sufficiently provide for negative moments if made in one unit, it was found expedient to splice all the bent rods of the 49-ft. 6-in. girders. The point of splice in each case occurs approximately where positive moment changes to negative at continuous ends. As in the design of other supporting members, all diagonal tension in excess of 40 lb. per sq. in. is resisted by rods bent at 45° with efficient anchorage. Stirrups are also provided.

From the roof layout in one of the drawings herewith, it will be seen that it was somewhat difficult and awkward to establish an effective expansion joint that would be directly in vertical line with the joints below. The joint is continued through the flat portion of roof on both sides of the sawtooth end walls and then up through the end walls, which in this instance consist of brick. All other end walls of sawtooth are reinforced concrete 6 in. thick. At the pinnacle of sawtooth, three ¾-in. rounds additional have been provided; extending into each beam of the inclined roof and into the small columns, the rods being located in the top of the section to reduce the appearance of expansion cracks at this point.

A reinforced concrete viaduct of simple design was adopted to facilitate erection, by avoiding as much as possible the use of beams or girders in the floor system. Bents consisting of arches and piers 24 in. wide are spaced 25 ft. c. to c. and located directly in line with columns of the building. The slabs between bents are 18 in. at the crown and 20 in. at the pier for all spans continuous over two supports and 20 in. and 22 in. respectively for end spans. The continuous slabs are reinforced with 1-in. rounds and 1⅛-in. rounds alternating 6 in. c. to c. for a width of 25 ft. symmetrical about the center line of two car tracks above. For roadways and sidewalks the same size bars, 8 in. c. to c., were used.

Pipe spaces for electric conduits, water mains, gas mains, etc., are concealed beneath sidewalks along both sides of the viaduct. The top slabs of these pipe chambers, which also form a part of the sidewalks, are made removable for future convenience should it become necessary to replace broken pipe or place additional pipe line.

The viaduct is 375 ft. long by 81 ft. 9 in. wide, with two expansion joints 1½ in. wide, each located 100 ft. from each end. A joint 1½ in. wide is also provided on the west side, separating the viaduct from the building. All piers or bents are carried to solid rock foundations.

The question of adequately supporting and spacing bars in a reinforced-concrete building has been conspicuously absent from the requirements of most specifications in the past. The erection of a building employing constantly from 100 to 200 iron workers, some skilled and others unskilled, made it imperative to eliminate as much as possible any uncertainty in the proper execution of this vital part of the work. Every slab and beam bar in the building is held up from the forms and spaced according to the engineer's design, by means of Securo supports and spacers. The results have been gratifying and most effective.

The exterior of all four sides is architecturally harmonious in design, consisting of a 6-ft. granite base, buff Bedford rusticated limestone facing in the first two stories, red mat brick with wide raked joints in the upper stories. The cornice is of buff-colored terra cotta with wide overhang and terra cotta brackets. The entire interior of building in all stories will be faced with white enameled brick, a feature that will add considerable light, besides presenting an immaculate appearance.

The construction will be as fireproof as modern practice will allow, consisting in the aggregate of reinforced concrete, brick, stone, terra cotta, metal windows with wire glass, steel stairs with fire-wall inclosures, metal doors and trim throughout. Nine inclosed emergency stair towers furnish ready egress from the building in case of emergency, while an electrically operated escalator is provided from the first floor to the top story for the use of employees coming to and leaving work. In addition to freight elevators for materials, electric elevators for the exclusive use of officers of the company and guests will be provided.

Unexcelled toilet accommodations, wash and shower rooms, locker rooms and lunch rooms will be installed in the most convenient localities throughout the building for the use of all employees. A well-arranged modern clinic with every appointment designed to meet all emergency cases is located in the first story. Heating, ventilating, electric-lighting and sprinkler systems are installed throughout the plant and are operated exclusively by electric power.

On account of the convenience offered by an old railroad switch entering the third panel from the north end of the building at the first floor level, provision was made in the design to retain this switch on a temporary wood trestle until the completion of the structure, to permit cars of material to enter the building and deposit their contents direct into bins located immediately south of track. Two gravel bins, each with a capacity of 1500 cu. yd., and one sand bin capable of storing 2000 cu. yd. are located near two 30-cu. ft. mixers. The sand and gravel of the bins are fed direct to the mixers by gravity. Two towers, each 310 ft. high, accommodating a 30-cu. ft. hopper, elevate the concrete to any desired height and through chutes inclined about 3 in. to the foot the mixture is conveyed to any part of the building.

The arrangement of the plant has proved most efficient, and at no time have the two mixers failed to keep pace with the carpenters and other trades engaged in erecting falsework, placing steel bars, etc., preparatory to concreting.

The structural design for the entire plant was prepared by W. J. Knight & Co. and F. C. Taxis, Associate Engineers. Windmann & Walsh and Klipstein & Rathmann are the associate architects.

The general contract is being executed by the Gilsonite Construction Co., of this city, of which L. J. Haenni is the Vice President and General Manager.

Due credit is given Dr. Rudolf Gull, Chief Chemist of the Anheuser-Busch Brewing Association, for his superior ability and initiative in dictating the general arrangement and future operation of machinery units, chutes, conveyors, etc., the proper distribution of which was so essentially fundamental to the correct execution of the design, to fulfill the requirements of a comparatively new and original enterprise.

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## Continuous Mixing for Concrete Products Plants

Some remarkable achievements in concrete products plants have to be credited to Kent Precision Mixers, which are made by the Kent Machine Company of Kent, Ohio. The company's literature will be found not only interesting but helpful, and every concrete man should have it. It is sent free on application.

Kent Precision Mixers are made for all classes of work, large or small. They embody the continuous mixing principle, together with exactness of automatic measuring. They perform their work accurately and upon economical basis. Their continuous-mixing, automatic-measuring action does away entirely with any handling of materials by hand labor, except that necessary to get materials into the hoppers. The entire process—measuring, dry-mixing, wetting, wet-mixing, and discharging—is mechanical. Every unnecessary expense in the process of mixing has been eliminated.

These mixers are built in stationary and portable types. Some of the portable machines are equipped with traction drive. Power operation can be through either steam, gasoline engine, or electric motor. The company also furnish these machines without power equipment.

The details necessary to automatic action are very carefully designed. The shape of the sand hopper is such that practically all sand in it rests directly on the ample feeding device, thus obviating the characteristic tendency of damp material to bridge across the hopper, out of reach of the feeder. The latter is very simple and effective, being easily adjusted to give exactly the desired proportions. The mixing apparatus is of the pug-mill type, the paddles being narrow so that they chop, stir, and turn the material.

The Kent Mortar-Mixing Machine embodies all the improvements that careful observation and study of the mortar mixer problem, and nine years' experience in the manufacture of concrete mixers, could suggest. The mixing trough of this machine is of ample length, with extension sloping sides. It is mounted upon high wheels, permitting wheelbarrow to be run under it for filling. This machine is equipped with a gasoline engine, and eliminates all hand labor from the operation of mixing mortar. A water spray pipe is attached to the trough, for tempering the mortar to the proper consistency.

It will repay intending purchasers of concrete or mortar mixers to obtain the descriptive catalog of the Kent Machine Company, Kent, Ohio.

# *A Small Concrete Lined Reservoir*

By Edward R. Stapley, C. E.

In the design of any system of waterworks intended to furnish water to a municipality, a reservoir of some sort is usually included. The introduction of this part of the system has been found to be desirable from the standpoint of economy and safety.

The reservoir may serve a great variety of purposes. It may allow the reduction of the capacity of pumps or their operation at full capacity for a portion only of the day. It may increase the capacity of the source of supply as well as of pumps and filters by making the demand more uniform. It may effect considerable economy in the size of the pipe in the distribution system. It also adds to the quality of the water by the measure of sedimentation afforded. Finally, it acts as an additional factor of safety against interruption and as a protective measure in case of fires, doing away with the necessity of duplication of certain parts.

In the construction of reservoirs various materials may be employed, such as earth, masonry, wood, and iron or steel. The material selected depends on such factors as the purpose, size and location of the reservoir, soil conditions, materials available, cost, etc.

This article will describe the design and construction of a small concrete lined reservoir having a capacity of one million gallons. So far the writer has been unable to discover in engineering literature any detailed information on a work of this character and will therefore relate some of the difficulties encountered, changes made in methods of construction as the work progressed, and also offer some suggestions as to better methods of procedure.

The plan and details of design of a reservoir of this type lately completed for the Town of South Boston, Virginia, in connection with improvements and extensions to their water-works system may be seen by referring to Figs. 1 and 2. Concrete was chosen as the material to be used on account of its cheapness while at the same time giving a practically water-tight structure. The section of the reservoir was chosen in order that the structure might be as compact as possible and at the same time keep the cost factor low by limiting the volume of concrete and the amount of form material required. The slope of the side walls was made one to one and one-half, this being as steep a slope as would allow the side walls to be built without any face forms and permit the earth banks to serve as the forms for the backs. In the construction of the reservoir proper no steel reinforcement was required.

This reservoir is situated on a hill on the outskirts of the town and as can be seen from the plans was constructed partly in cut and partly in fill. This method reduces to a minimum the charge for excavation and embankment as the material in cut was used in making the embankment on which the sloping side walls were constructed. The excavated part was carefully made and trimmed to line and surface, the embankment being made full and the inside trimmed down after being compacted and allowed to stand for several weeks. The excavation in the bottom was carried six inches deeper than the bottom of the concrete lining and this space refilled with puddle composed of clay, sand and fine gravel. In making the embankment the material was deposited evenly in layers about six inches thick and thoroughly solidified by rolling. After being rolled each layer was wet by sprinkling just ahead of the new layer being deposited, which was immediately rolled. A small horse drawn roller, was used, weighted down with stone and pigs of lead.

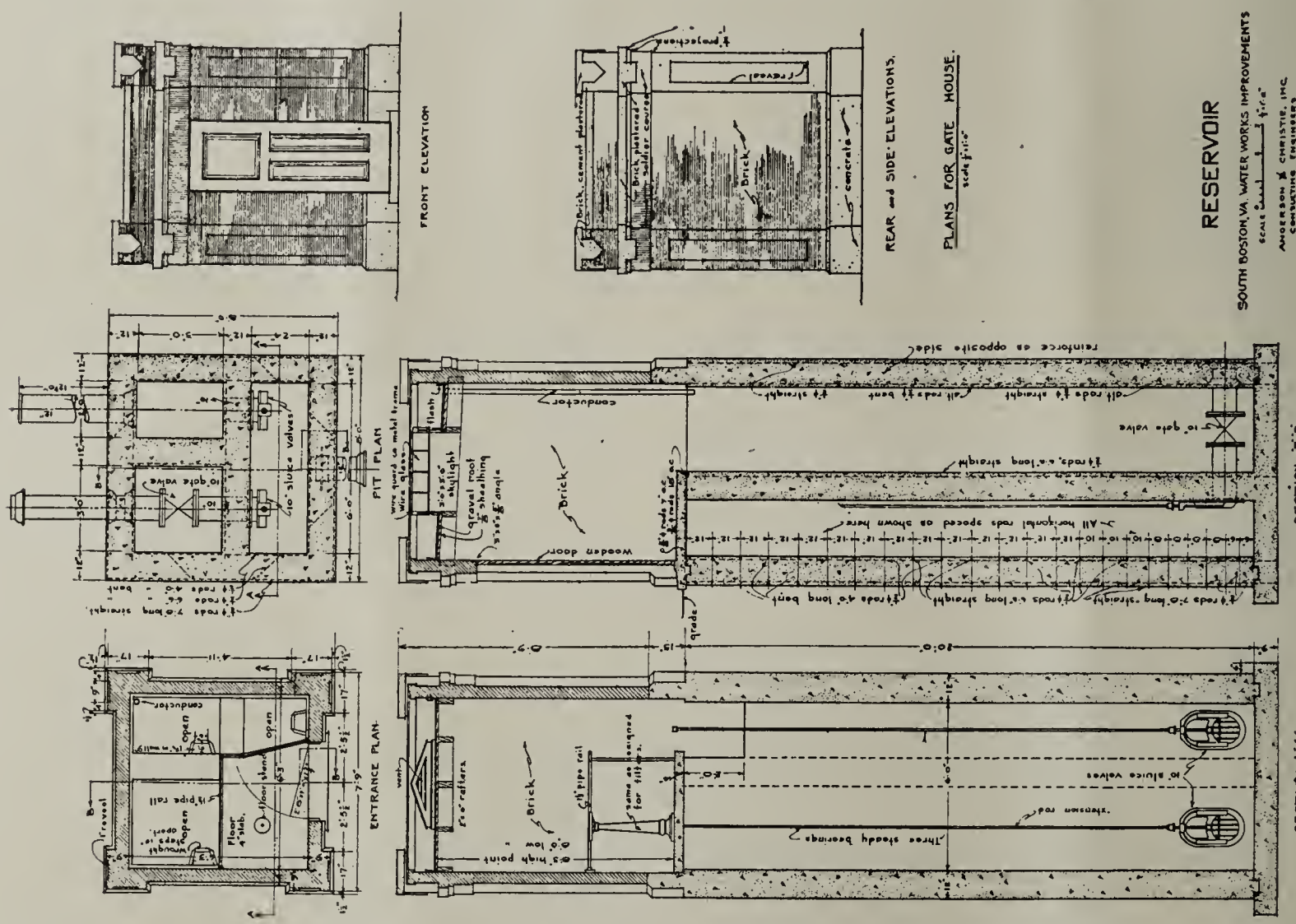
View of Reservoir When Partially Completed

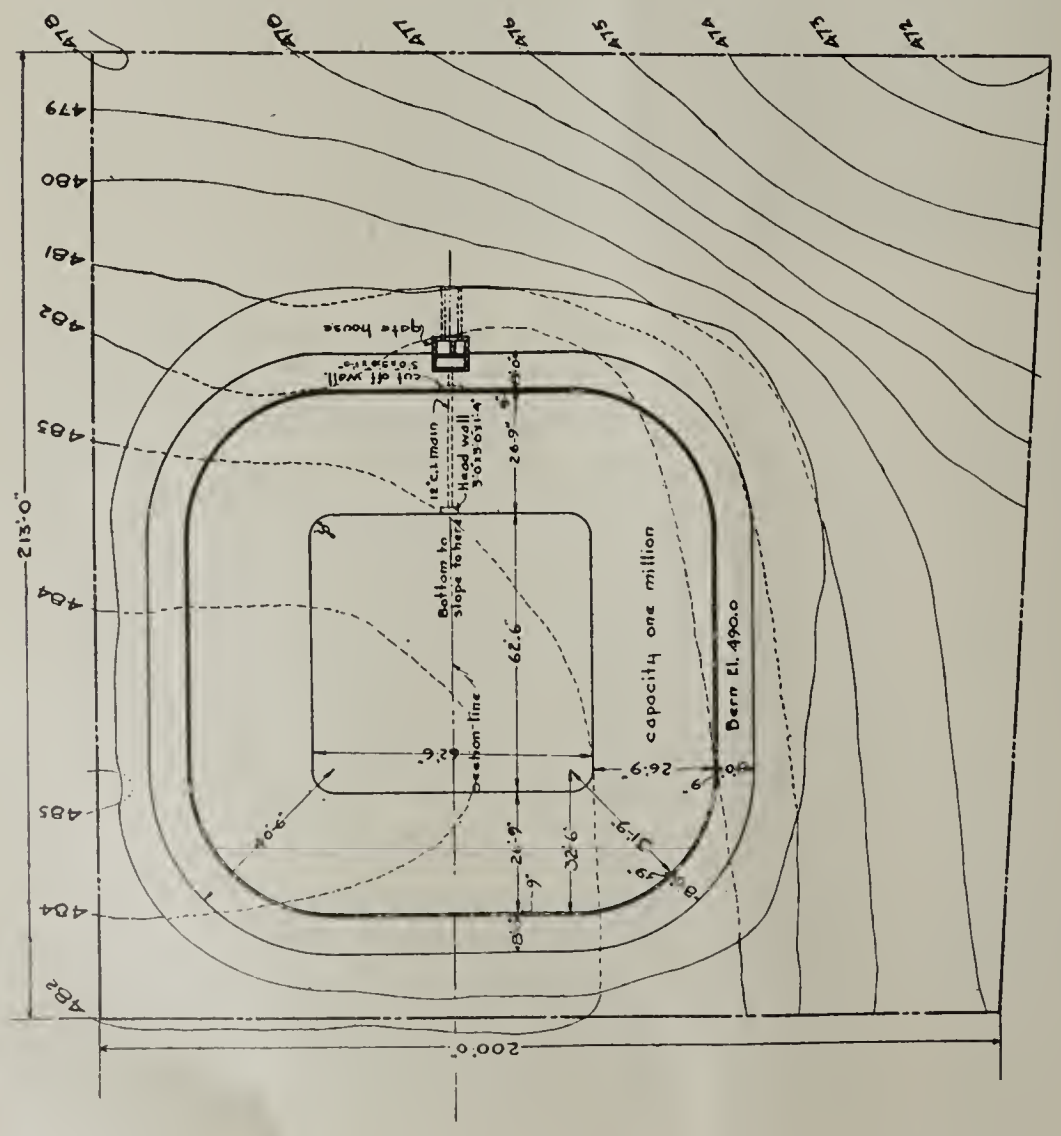
After completion of the grading and the trimming of the sloping banks, the concrete work was begun. A one, three and five mixture of Portland cement, sand and broken stone was used throughout. The six-inch bottom was first laid in a monolithic slab, trapezoidal pieces of timber being inserted in the green concrete near the outside edges of the bottom to provide a joint for the side walls.

The concrete bottom having become sufficiently set, the nine-inch lining for the sloping side walls was started. The description of this portion of the work will be better understood by referring to Fig. 3, which is a view of the reservoir when partially completed. Planks to serve as guides for screeding were placed on the side slopes and securely held to the proper line

and grade by fastening to stakes driven into the earth slopes. These planks were so placed as to leave sections approximately eight feet wide between them, this width proving to be a desirable one for placing the concrete and screeding and smoothing the surface. Pieces of timber similar to those used in the bottom were spiked to the face of the planks to form a key for the adjacent section.

As may be seen from that portion of the side slope nearest the gatehouse, it was first intended to construct alternate slabs of eight foot width leaving the intermediate slabs to be completed later. It was decided, however, to change this method of procedure by decreasing the width of the sections omitted to about eighteen inches and the remainder of the construction was done in this manner. In this way it was thought to eliminate almost entirely the formation of cracks between the adjacent slabs due to contraction in set-



ting, since the wide slabs were allowed to set for some time before the narrow ones were laid and the small width of these latter gave very little contraction. On account of the numerous construction joints along the side slope no expansion joins were provided.

In mixing the concrete a small portable gasoline mixer was used. This was placed on the top of the embankment and moved around the reservoir as the work progressed. Two sections could be poured without moving the mixer.

The separate sections were constructed in much the same manner as are concrete sidewalks. It was necessary to have the mortar quite stiff in order to keep it in place, as a wet batch was sure to land in the bottom, due to the rather steep slope of the banks. The mortar was thoroughly tamped in place, and screeded and given a rough finish true to grade. Each section was completed before stopping work on same for the day. The curved corners were divided into small wedge-shaped sections, each being finished with flat surface instead of curved. At the top, stakes for the curved corners were set with a transit by turning off deflection angles. After all of the sections had been poured as shown and a short period allowed for their setting, the remaining sections were placed, these being screeded to those already in place.

As will be noted the curb was not poured with the sloping side section. These latter were cut-off at a point near the bottom of the fifteen inch radius curve through which the side lining is continued to form the vertical wall above the berm. Forms were used in moulding the curb which was constructed in sections corresponding to the ones on the side slopes. The curb at the corners was made curved however, instead of being divided into several small tangents.

After the concrete in all of the sections had been poured, the entire surface was given two brush coats of cement grout. This grout was mixed to about the consistency of whitewash and applied in thick coats as possible. This served to make the concrete more impervious and give the surface a more finished appearance. It would appear to the writer that a better job might possibly result if the concrete sections were constructed in exactly the same manner as a two-course concrete sidewalk, a surface course of cement mortar in the proportion of one to two being laid and finished while the base was still green. This procedure would, however, be more expensive than that followed on this contract.

The small gate-house detailed in Fig. 2 and shown in the view as being partially completed is constructed of reinforced concrete with a brick superstructure. It houses a ten-inch electrically operated gate valve and two ten-inch sluice valves. A ten-inch line of cast iron pipe leading into the gate-house from the town serves both as an inlet and an outlet. A single ten-inch line leads from the gate-house to the reservoir. Making one pipe serve as inlet and outlet to the reservoir decreased by about one mile the length of pipe that would otherwise have been required, and at a time when the price of cast iron is soaring, this saving amounted to considerable. A twelve-inch pipe to serve as an overflow and drain is shown leading from the house. The gate valve on the inlet and outlet line is operated electrically from the pumping station, being left open ordinarily but capable of being shut immediately when extra pressure is needed as in case of fire.

The stopping of the ten-inch pipe to the reservoir at the bottom of the sloping side wall would appear to the writer to be a feature which might perhaps have been improved upon. Continuing this pipe across the bottom of the reservoir by making use of terra cotta pipe, alternate sections to have small Tee outlets opening upward, and protecting this pipe with a concrete casing would perhaps effect a better mixing of the water in the reservoir and prevent any tendency to stagnation.

This reservoir was designed by Anderson & Christie, Inc., of Charlotte, N. C., and was built under their supervision. R. K. Stewart & Son of South Boston, Va., were the contractors on the work. The contract was let on April 10th, 1916, the contract price being $5,298.00 for the reservoir and gate-house complete, including everything except valves and cast iron pipe which was furnished by the town and the puddle in the bottom which was paid for extra. Of the amount $835.00 was for the construction of the gate-house.

## Cars for Block and Tile Plants

The Globe Machinery and Supply Company, who have for years manufactured brick dryer cars, are putting a new and very efficient tripledeck cement tile and block curing car on the market.

The construction of this car meets a long felt want among tile, pipe and block men for a car at once strong, easy running, easy to load, and durable. The Globe car is all of these, and yet moderate in price.

These cars are standard 24-inch track gauge. Among their many features of advantage the construction of the decks is probably the greatest improvement. The second and third decks can be raised from either side, and hooked up, while the lower ones are being loaded. This greatly facilitates loading, and as the decks are movable, the upper one can be taken off and the second one raised to a suitable height to permit the loading of extra length tile conveniently.

Globe cement tile and block car bodies, deck frames, and uprights are of angle iron, rigidly braced. These cars will carry their full capacity on all three decks and still move easily, because of the oil-tight roller bearings, and are thus freed from the usual jarring and bumping of a hard running car.

This car is fast becoming the popular car among central western tile and block makers because of its durability, convenience in loading, light weight, and moderate price. No trouble has yet been experienced in making deliveries.

Write Cement & Engineering News, Transportation Bldg., Chicago, for catalog illustrating and describing these cars.

## Correction

The article on "Concrete Cottages for Railroad Employes" on page 313 of our December issue was furnished us by the publishers of Railway Maintenance Engineer. We failed to give this magazine credit for the very interesting article and herewith wish to correct the error.

# Ornamental Concrete Shell for Steel Water Tanks

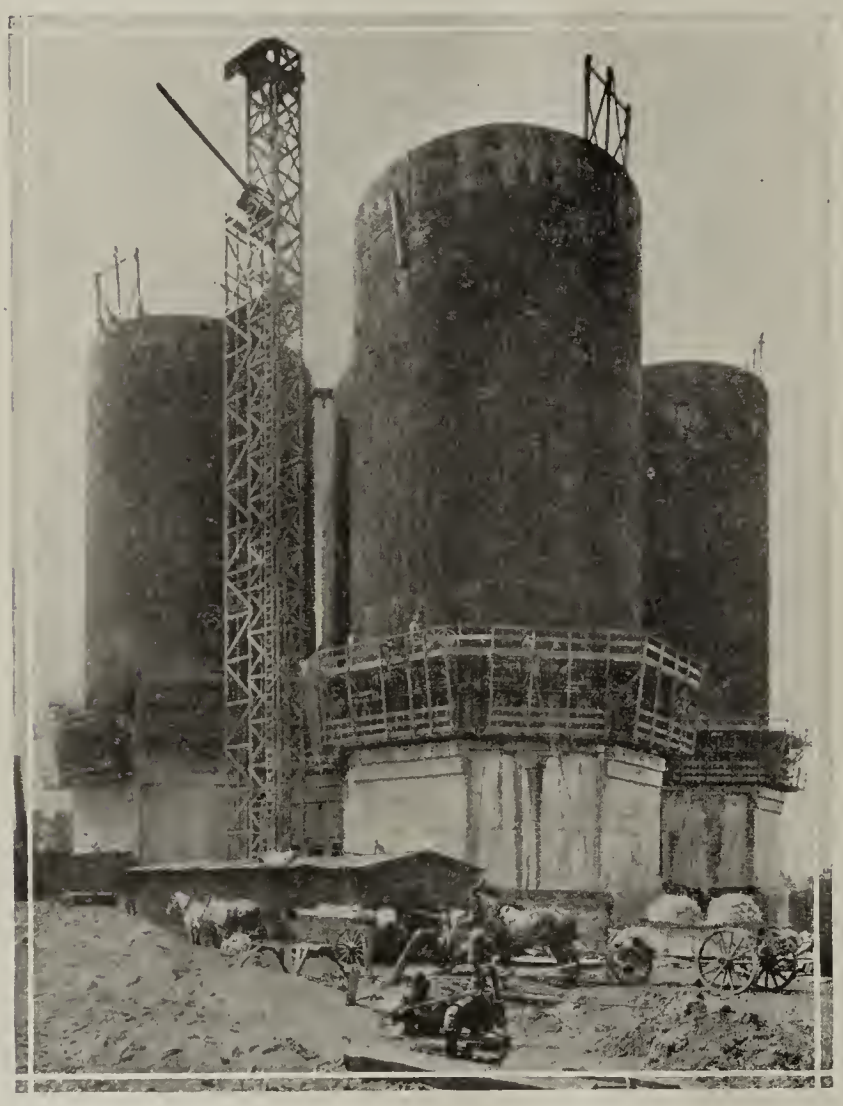
The City of Cincinnati, having received complaints and opposition from real estate holders regarding the appearance of large steel water standpipes, have recently taken steps to improve conditions from an architectural standpoint, and ornamental concrete structures have been erected around the standpipes by The Ferro Concrete Construction Co.

The accompanying illustration shows the Eastern Hills Tanks almost completed. When finished the top of the structure will present the appearance of the battlements of an old fort.

There are five tanks in the group on Eastern Hills and their relative positions will be seen from the illustration.

### Method of Erecting Forms

After the steel cylinders had been erected they were filled with water so that they would have the same



shape as when in actual service. It was feared if concrete was poured while they were empty, slight changes in shape might take place when the water was let in, and this would cause cracking of the concrete shell.

The forms for the first section setting were supported on the foundation and braced to the ground. Forms for subsequent settings were raised from floats which can be seen in the illustration. A lifting derrick will be seen at the extreme right of one of the illustrations. The derrick rests on a two-boom crab-operated rig resting on empty oil barrels on the water surface of each of the four corner tanks. Since each panel weighs about a ton it is practically impossible to pick this weight from a floating platform of reasonable cost which would fit in a 40-ft. circle. Flotation is therefore used only when rotating the rig from one form to the next. In order to support the load the rear end of each float is blocked down from the Z-bar which forms the top of each tank, and the forward end is held by hooks over this Z-bar.

### No Interruption in Concreting

The foundation plan was about 100 ft. on the side and from 270 to 300 yards of concrete is required for a complete lift, this to be distributed over a considerable area. It was therefore possible, by using stop planks to concrete one-half of the structure while the horizontal reinforcing was being set and while the forms were being raised on the other half, thus the mixing plant was kept going at the rate of 100 yards or more a day. The total volume of concrete placed exclusive of footings was about 3800 yd.

The hoisting tower is double, equipped with Leschen wire rope, one side being used for the concrete skip and the other having an elevator for the workmen. The tower also has a boom for raising the reinforcing.

The tanks were designed and built under the direction of J. A. Hiller, General Superintendent of the Cincinnati Water-Works. T. J. Mulloy is resident engineer in charge. The Ferro Concrete Construction Co., of which W. P. Anderson is president, are the contractors. J. Hodges is in charge of the work for the contractors, while the forms and methods of construction were designed by Henry D. Loring, engineer for this firm.

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# Hendrick's Commercial Register for Buyers and Sellers

The twenty-sixth annual edition of Hendricks' Commercial Register of the United States for Buyers and Sellers, has just been published. This standard publication is especially devoted to the interests of the architectural, contracting, electrical, engineering, hardware, iron, mechanical, mill, mining, quarrying, railroad, steel and kindred industries. Full lists are included of producers, manufacturers, dealers and consumers, listing all products, from the raw material to the finished article, together with the concerns handling these products, from the producer to the consumer. There are 2,209 pages of text matter and the index to trade classification numbers 151 pages, covering over 50,000 trade references. The list of trade names, brands, titles of identification, etc., numbering 1,212 pages, furnishes ready reference to distinctive products manufactured by concerns listed in the work. The alphabetical section is included for the first time and contains in one alphabetical list the name, trade description and address of every concern appearing in the book.

S. E. Hendricks Company, Inc., 2 W. 13th St., New York City. Price, $10.00.

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# Portland Cement Association

B. F. A. Affleck, Chicago, was re-elected president of the Portland Cement Association at its annual meeting at the Hotel Biltmore, New York, December 12. Mr. Affleck is president of the Universal Portland Cement Company. F. W. Kelley, president, Helderberk Cement Company, Albany, N. Y., was elected first vice-president, and Richard Hardy, president, Dixie Portland Cement Company, Chattanooga, second vice-president. G. S. Brown, president, Alpha Portland Cement Company, Easton, Pa., was elected treasurer.

The Portland Cement Association has turned its activities largely to the promotion of permanent roads in line with the desire of the Council of National Defense that through routes be quickly developed to supplement the railways, especially for short-haul traffic.

## Some Hints on Concreting in Cold Weather

During the first few days following the placing of concrete, alternate freezing and thawing at comparatively short intervals will damage it. The following suggestions relative to concreting in cold weather have been offered by the Portland Cement Association:

Although concrete which freezes before early hardening has been completed may not be permanently injured, if after thawing out it is not again exposed to freezing until hardened, protecting the concrete against possibility of freezing is best. Therefore it is necessary to so mix, place and protect the concrete that early hardening will be complete before the work is exposed to freezing temperatures. To do this:

(1) Sand and pebbles or broken stone used must be free from frost or lumps of frozen materials.

(2) If these materials contain frost or frozen lumps, thaw them out before using.

(3) As cement forms but a comparatively small bulk of the materials in any batch of concrete, it need not be heated.

(4) Mixing water should always be heated.

Although adding common salt to mixing water will prevent freezing of concrete that has not hardened, there is a limit to the quantity of salt which may be added if the final strength of the concrete is not to be affected. Salt simply lowers the freezing point of the mixing water; it does not supply what is most needed—heat and warmth. It delays, instead of hastens, the hardening of the concrete.

Sand and pebbles or broken stone and mixing water must be heated so that the concrete when placed shall have a temperature of from 75 to 80 degrees.

Some sands are injured by too much heat. The same applies to certain varieties of pebbles and broken stone. A temperature not exceeding 150 degrees Fahrenheit will generally prove most satisfactory.

Place concrete immediately after mixing so that none of the heat will be lost before placing in the forms.

Warm metal forms and reinforcing before placing concrete. Be careful to remove ice and snow and frozen concrete remaining on forms from preceding work. Forms can be warmed by turning a jet of steam against them or by wetting with hot water.

Even though materials have been heated and the concrete placed immediately after mixing, it will lose much of its heat if not protected from low temperatures.

To protect the concrete immediately after placing. Canvas covering, sheating, housing-in the work, or hay or straw, properly applied, will furnish the required protection for some work. In addition to these means, small oil or coke-burning stoves or salamanders may be used in enclosed structures.

Temperatures which may not be low enough to freeze the concrete may, nevertheless, delay its hardening for a considerable time. Do not expect concrete placed when the temperature is low and remains low for some time afterward to be safe for use as soon as though placed during warmer weather.

If concrete is unavoidably delayed or interrupted the work should be covered until concreting is again begun.

Cover and protect any section of the work as soon as completed. In severe cold weather, continue this protection for at least five days.

Forms must not be removed from the concrete work too early. This applies to any concrete work, regardless of season, but is particularly important with work done during cold weather.

Frozen concrete sometimes very closely resembles concrete that has thoroughly hardened. When frozen concrete is struck with a hammer, it will often ring like properly hardened concrete. Before removing forms, examine the work carefully to see whether it has hardened or is simply frozen. To determine this, remove one board from some section of a form, pour hot water on the concrete or turn the flame of a plumber's blow torch or a jet of steam under pressure against the concrete. If frozen, the heat will soften the concrete by thawing the water contained in it.

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## America Must Be United

In this time of unprecedented national peril and world-peril, America must be strong with the strength of unity—one nation. America must be bound together, as it is to-day, not so much by the machinery of Government, as by Ideas, held in common by all and fully exchanged, so that all the people throughout the country may understand and sympathize with one another. This is what has brought this great nation together and holds it together. This result has been accomplished primarily by the Press—particularly the weekly and monthly periodicals and business papers. These periodicals have not local or sectional bias; they go to all parts of America, and serve all parts alike; their great service is in helping to bring all sections close together into one great nation, through a common understanding. America must not be split into a half-dozen sections, weak with the ills and evils of sectionalism.

But such a disastrous result is not only possible, but probable, unless the present law pertaining to second-class postage is repealed before it goes into effect. Postal legislation was enacted in the present Revenue Bill, which divides the country up into "zones" and progressively increases the average carrying charge upon newspapers and periodicals from 50 to 900 per cent.

These nation-binding publications are confronted with certain injury or destruction—which means loss to you personally, and loss to your country. It will destroy a large part of the periodicals. You will be deprived of the papers that have kept you informed on your country's problems, that have helped you in your work. Your children will lose the clean publications that have entertained and helped educate them. And eventually, such magazines as do survive, will cost you much more.

No increase is necessary. Last year the Postal Department earned a surplus of nearly $10,000,000.

The Postoffice was never intended as a tax-gathering institution. It was basically designed to give service to the people—to all the people at the same rate. The publishers are not trying to evade taxation. They will gladly accept any rate of tax upon their profits that may be levied. Most of them have gone on record as being willing to turn over to the Government their entire net profits for the period of the war. They already pay proportionately more taxes than most businesses, but this advertisement is not designed to parade selfish troubles, but to awaken your interest in the danger of permitting the destruction or obstruction of the channels of national intelligence.

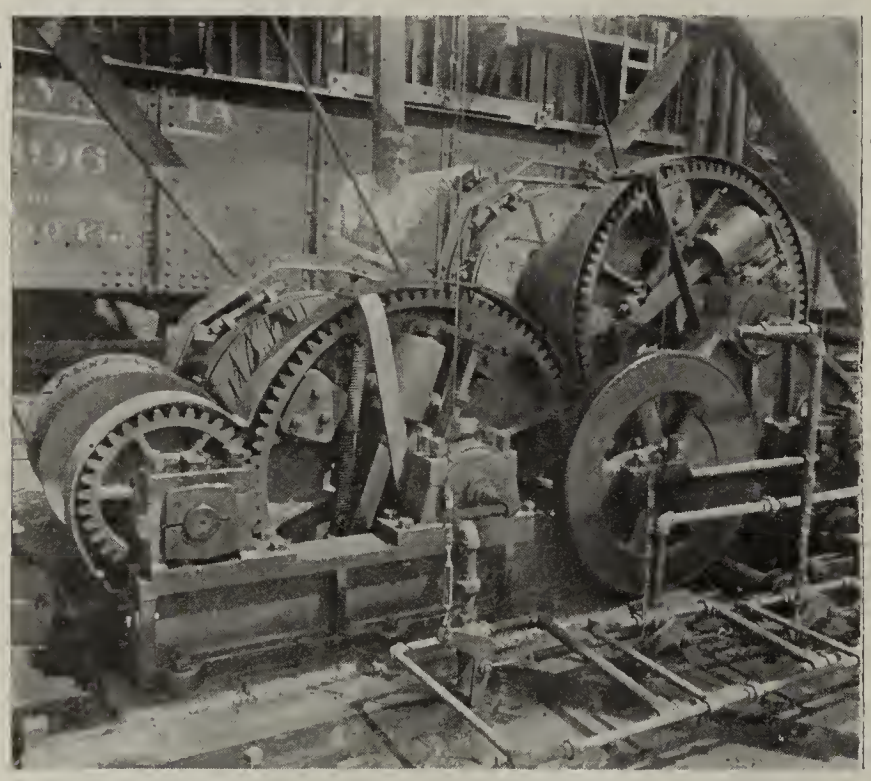
This is the time of all times when America must be a united America—one nation strong with the strength of unity. Let your influence be used to that end. Write your congressman and senator protesting against the tremendous increase of postage on magazines and trade papers, which is unfair and iniquitous.

# *Up-to-Date Cableway Plant with Screens and Crushers for 1,500 Tons a Day*

The sand and gravel plant of the Delavan Co. at Machias, N. Y., is working sand and gravel from a 90,000,000-ton deposit, excavating same by a slack line cableway which digs the material and conveys same to the screening plant, where it is washed, oversize stones crushed, and the product dropped into hoppers from which it can be loaded into cars by gravity, practically the entire operation being effected by powerful, high-class machinery with minimum hand labor.

The sand and gravel is excavated by a 2-yd. dragline bucket operating on a cableway of 500-ft. span with a head tower 150 ft. high.

The 2-yd. Sauerman dragline excavating bucket is at present operated with a back haul line driven by a slip friction drum on the engine because it was necessary at the beginning of the work to install the main cable with unusually small deflection in order to clear



Double-Cylinder Engine Operating Sand Bucket at Speed of 1,200 Feet

a hummock in the sand bank. After the top of the hummock has been cut down it will be practicable to increase the deflection of the cable and thus enable the bucket to be returned in the usual way by gravity and eliminate the back haul line and drum. Under present conditions the bucket has been operated at the rate of one round trip per minute and averages 55 trips per hour, thus providing for a plant capacity of about 900 yd. per 8-hr. day.

The bucket operator is located on an elevated tower platform that commands an unobstructed view of the cableway line and of the bucket in all positions, and is equipped with power control for the levers, thus relieving the operator of all physical effort and thereby materially increasing the efficiency of the plant so as to effect a gain estimated at fully 25 per cent, that amount or more having been gained by power control in other installations.

The excavator bucket dumps on grizzly bars which pass all the sand and pebbles up to 3 in. in diameter. The fine material is graded in a battery of cylindrical screens where it is washed and then transferred by a 160-ft. belt conveyor to the storage house and track piles of 100,000-ton capacity for two grades of sand,

Two-Yard Sauerman Dragline Bucket Operated on Cableway, Excavating Sand and Gravel

one grade which will be passed by a ⅝-in. and held on a ¼-in. screen, and another grade, all of which will be passed by a ¼-in. screen. The gravel and broken stone is of three grades, number one, which will be passed by a 2¾-in. and held by a 1½-in. screen, number two, which will be passed by 1½-in. and held by ⅝-in., and number three, which will be held on a ⅝-in. screen.

The rejects from the grizzly and from the first screen are delivered through chutes to a McCully crusher with a capacity of 500 tons a day that reduces them

Battery of Cylindrical Screens Separating Sand, Gravel and Rejects

to the required size for the screened gravel and then are taken from the crusher by an endless chain bucket conveyor back to the screens.

While passing through the screen the sand is washed by 1,800 gal. of water per day, pumped from a well, filtered into a storage reservoir, and used over and

over again. For this purpose three 600-gal. centrifugal pumps are used which are driven by a 70-hp. Erie City Iron Works engine.

Another 110-hp. engine of the same make operates the rope that runs the screens, the crushers, and the bucket elevator. Steam is supplied by two 125-hp. horizontal tubular boilers made by the Union Iron Works.

The storage bins deliver by gravity to standard-gage cars on surface tracks, thus eliminating hand labor and enabling the plant to deliver its product at the rate of 1,500 tons a day.

Surplus product not delivered to the storage bin is conveyed to and stored in track piles by a belt conveyor from which it is reclaimed by a 7-ton locomotive

**Shearer & Mayer Cableway of 500-Foot Span With Anchor Car Operating Dragline Bucket**

crane, operating a 1-yd. clamshell bucket with which the cars can be loaded at any time, the crane also being used for spotting cars.

The cableway engine is of special design and is a double cylinder 12x12-in. machine operated by steam at 125 lb. It drives the cable tension drum, handling the line under 12,000 lb. stress at the rate of 250 ft. per minute.

The plant was designed and its entire construction supervised by H. F. Shaper, chief engineer, of the Delaven Co., and who is now general superintendent in charge of plant.

**Dragline Scraper Delivering to Grizzly in Screening Tower**

## Crushed Stone Production

Crushed stone, representing 37 per cent of the value of total stone quarried, was valued at $29,462,952 in 1916, an increase of 1 per cent over 1915, the increase following a decrease of over 3 per cent in 1915. Of the total crushed stone 60 per cent was limestone, 22 per cent basalt, 12 per cent granite and 6 per cent sandstone.

## Convention of the American Road Builders' Association

It has been decided to hold the fifteenth annual convention of the American Road Builders' Association at the Hotel Statler, St. Louis, Mo., during the week February 4 to 7, 1918. In view of the influences that have hampered highway construction during the past year or more, and the vital need of a system of road transportation to relieve the already overburdened railways, the coming meeting promises to be the most important in the history of the organization.

In selecting the convention city, the directors of the association took into consideration the conditions surrounding road building at the present time and decided that because of the vitally important problems to be considered a great national gathering of men interested in highway construction and maintenance should be held at some central point where a large attendance could be secured without undue inconvenience. St. Louis was chosen because of its facilities for handling a gathering of this character and also because of its location close to the center of population.

Owing to the difficulties of railroad transportation, it is felt by the Association that it should make no plans which would in any way interfere with the transportation of materials needed for war purposes. It has been decided, therefore, to abandon for this meeting the great exhibition of road building machinery, materials and appliances which, for a number of years, has been an important feature of the Association's conventions, and to limit the good roads show in connection with the forthcoming convention to such display of materials, models, photographs, literature, etc., as can be shown in the large ballroom of the Hotel Statler. Another year, it is hoped that conditions will warrant holding the usual exhibition of machinery and materials.

While the convention program is only in a formative stage at present, sufficient acceptances have been secured to assure the attendance of speakers of international reputation in their respective lines. In addition to the technical men, it is planned to have leaders in financial and business circles address the convention on the commercial side of road building and, if conditions permit, it is expected that Government officials will also speak. The aim, in fact, of the committee in the preparation of the program will be to emphasize the importance of road improvement not only as a state and nation-wide problem, but as a vital factor in national preparedness.

It is expected that the St. Louis convention will be the only large gathering of road builders and users which will be held during the year 1918.

## New Illustrated Booklet Link Belt Casings for Silent Chain Drives

A handsomely illustrated booklet describing casings for link-belt silent chain drives has just been issued by the Link-Belt Company of Chicago. These casings are oil tight and dust proof and make it possible to keep the chain drive constantly and well lubricated. Safety first is the watchword of the modern plant today and casings make for absolute safety.

## Cement Plant Closes Down

The Cayuga Cement Corporation, Portland Point, New York, on account of the scarcity of coal and labor which are so badly needed in other lines of manufacture in the vicinity of its plant, closed its plant on December 15, 1917, to be reopened in the late Winter or early Spring. The company's storage bins are full of cement.

# *Application of a Trailer to the Truck*

## Some Comparative Figures of Operating Costs of a Five-Ton Truck Versus a Five-Ton Trailer

The strongest arguments in favor of the adoption of the trailer as an auxiliary to the truck are: First, increased carrying capacity; second, reduced hauling costs. Economy and efficiency in truck-trailer operation are insured if due consideration be given the character of the material to be hauled in its relation to the trailer equipment, loading and unloading methods, etc. This statement is based upon the presumption that a preliminary study of the local hauling conditions has shown that the roads are hard surfaced and that the maximum grades do not exceed ten per cent.

Outfit of Calvert's Sons, Detroit, Mich. Four-Ton Trailer

On long hauls the lowest hauling costs are obtained where the tonnage moved per trip is greatest. In such case the additional hauling capacity afforded by the use of trailer assumes prime importance. If the truck hauls three tons working alone, when with the trailer equipment it might just as well haul six or more tons at a very slight additional operating expense, the value of the trailer is apparent.

On long hauls the question of speed is an important factor. The trailer must be built to run just as fast as the truck can pull it. A slow-speed trailer, by limiting the speed of the truck nullifies the advantage to be gained by carrying the double load. If, however, it is impossible to operate truck at its normal speed, in districts where the traffic is congested, the use of trailer will effect the loss occasioned by the reduced speed.

Where the hauls are short the item of lost time, that is, the time spent in loading and unloading truck, assumes first importance. It is imperative, therefore, that this lost time be reduced to the minimum. The truck, to be a profitable investment, must be kept moving. It is too costly an article to be used as a loading platform, and should be kept under pay load as much of the time as possible. This may be accomplished by the use of one or more trailers. Extra trailers may be quickly put in or taken out of service, and when not in use represent a much smaller investment than the same carrying capacity in motor trucks.

If only one trailer is used it can be loaded while the truck is making the trip alone, and be picked up by the truck every other trip. Two trailers can be used to still better advantage, while a fleet of three trailers makes a very efficient hauling unit, especially where loading and unloading take up a large part of the truck's time. In the latter case it may be found good practice to use truck only as a tractor and keep it in motion almost continually. One trailer may be kept at each end of the haul, while truck is in transit with the third trailer.

To illustrate the importance of utilizing the trailer as a loading platform, in place of the more expensive truck:

A conservative estimate of operating cost for a five-ton truck is $16 a day. Every minute this truck is not in motion costs two and two-thirds cents—every hour $1.60. The truck not only makes no money while standing still—it loses money. It makes money only while in motion. If it can be kept moving ten hours a day, so much the better—the profits will be correspondingly greater.

Say the trailer costs $4 a day to operate, or two-thirds of a cent a minute, or forty cents an hour, for every hour it is used in place of the truck it saves the difference between $1.60 and forty cents. Moreover, to this amount must be added the profit the truck makes when it is kept under pay load. When truck is running it not only makes the $1.60 an hour operating cost, but a profit besides. When it is standing still it loses the $1.60 an hour operating cost plus the profit it might have made by being under load.

On short hauls the reversible feature of a trailer is a great saver of time and labor. With a reversible model it is not necessary to turn the trailer around—truck may be attached to either end, and the trailer can be backed in a moment into any position desired. It is not necessarily laborious to detach the drawbar from one end of the trailer and fasten it to the other—both ends are alike. The only time lost in reversing the trailer is the time it takes the truck to turn itself and back into position to receive the coupling link. The item of reversibility saves more time than might be imagined. For example, say it takes six minutes to reverse an ordinary trailer which makes four trips a day, it must be turned or reversed at the end of every trip, or eight times during the day, with a total elapsed time for the day of forty-eight minutes. This is time lost in more ways than one, as the running time of the truck is reduced and the working time of labor is curtailed. The helpers must stand around until the turning or reversing operation has been completed.

Five-Ton Trailer Operated by the Superior Sand & Gravel Co.

Below are comparative operating costs of the five-ton truck versus a five-ton trailer:

**Truck**

| | Per day |
|---|---|
| First cost of truck, $4,000 (life, five years, working 300 days per year, 1,500 days) | $2.66 |
| Gasoline—Twenty gallons per day at twenty-two cents | 4.40 |
| Oil—One and one-half quarts at sixty cents per gallon | .23 |
| Tire cost based on price to the consumer, S. V. pressed-on tires, six-inch front and six-inch dual rear, $330. Assuming truck will run fifty miles a day and figuring on the basis of the 7,000 mile tire guarantee of manufacturers, this gives .047 a mile, or for the fifty miles | 2.35 |
| Repairs at $400 per year | 1.33 |
| Driver's salary | 3.50 |
| Insurance, fire, at $1.50 per $100 on value of $4,000 per year $60 | .20 |
| Insurance, liability, and property damage. This runs from $50 to $126 a year for a limit of $5,000 liability and $1,000 property damage. We have figures on the basis of $100 a year, or | .333 |
| Hard grease—Cups and wheels at $6.00 per year. | .02 |
| Transmission oil at $5.00 per year | .016 |
| Interest on investment at six per cent | .80 |
| License fee, $5.00 per year | .016 |
| Total operating expenses of truck | $15.85 |

**Trailer**

| | Per day |
|---|---|
| First cost of trailer, equipped with seven-inch rubber tires, $1,540 (life, five years, working 300 days a year, 1,500 days) | $1.03 |
| Tire cost, based on price to the consumer, seven inch S. V. pressed-on tires, $243.96. Assuming trailer will run fifty miles a day, and figuring on the basis of 7,000 miles guarantee of manufacturers, this gives .034 a mile, or for the fifty miles | 1.70 |
| Repairs at $50 per year | .167 |
| Insurance, fire, at $1.50 per $100 on value of $1,540 per year $23.10 | .077 |
| Insurance, liability, and property damage. Trailer rate is twenty-five per cent, of truck rate; therefore, the rate for a year would be $25, or | .083 |
| Grease at $1.00 per year | .003 |
| Interest on investment at six per cent. per year, five ton $1,540, per year $92.40 | .308 |
| License fee estimated $5.00 per year (not required in some places) | .016 |
| Increase of gasoline consumption and tire wear on truck, estimated at ten per cent | .675 |
| Total expense of operating trailer | $4.059 |

In making the accompanying calculations, the sizes of the truck tires were assumed to be on trucks of five-ton capacity with tires 36 x 6 front, and 40 x 6 dual, rear.

In selecting these sizes, five different representative trucks were used. The standard makes of truck tires are at present time guaranteed for 7,000 miles of service trucks, and of course this guarantee holds good on trailers. However, long tests have proven that we should be entitled to a guarantee of at least 10,000 or 11,000 miles when these same sizes of tires are used on trailers. This matter has been taken up with the tire companies and they have agreed that it is reasonable to expect a longer life for tires when used on a trailer than when used on a truck, but they do not care to complicate matters by giving guarantees for different periods of time.

The items of insurance were arrived at in the following manner: The liability insurance for trailers is now twenty-five per cent of the premium charged for trucks. The fire insurance is the same as charged for trucks in proportion to the list prices.

The salary of drivers has been placed at $3.50 for the five-ton truck. As the price of drivers varies from $15 to $25 per week, this is an item upon which no exact figures can be compiled.

For the purpose of comparison, we have made the life of the trailer five years. As a matter of fact, under average conditions, it will last indefinitely, as it is not subject to as severe strains as is the truck.

Standard high-grade trucks and trailers have been taken for the basis of these calculations.

There is no reason to believe that the amounts charged to trailer repairs will be as high as the figures given, and we have made these figures much more liberal than past experience in trailer repair would seem to warrant.

Many trucks carry a helper, which slightly increases the operating cost of truck. When trailer equipment is added this makes the cost figures still more pronounced in favor of the trailer, as the carrying capacity of truck is doubled with no additional labor cost.

It should be understood that the foregoing costs have been figured at prevailing market prices and as nearly accurate as posible, but they will not fit individual cases, as the costs vary so widely in class of work, cost of materials, road conditions, material to be handled, etc.

## New Westinghouse Catalog of Industrial Motors

The second of a series of catalogs of industrial motors has just been distributed by the Westinghouse Electric and Manufacturing Company of East Pittsburgh, Pa. This is known as Catalog 30, and covers the company's complete line of direct current motors and generators for industrial service.

After several pages giving general information regarding the ordering, classification and selection of direct current motors there follows complete description, rating, and dimensions for type SK commutating-pole motors, various modifications of type SK elevator motors, reversing planer motor equipment, type CD motors, headstock equipment for woodworking plants, type SK and CD motor generators and arc welding equipment. Much new information is given, especially on such subjects as arc welding, headstock equipment, motion-picture service and battery charging service.

The new catalog is identical in size and will fit the binder for the company's line of catalogs covering supply apparatus and small motors.

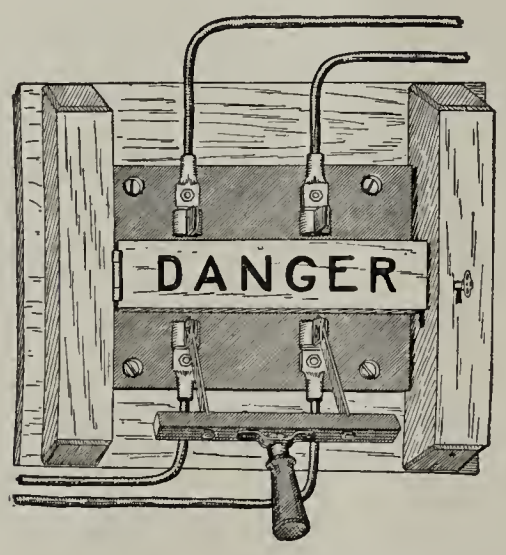
## Peerless Cement Plant Busy

The factory of the Peerless Portland Cement Company, Union City, Mich., still continues manufacturing operations, and, if sufficient coal is obtainable, and if the weather is not too cold and stormy, the management confidently expects to keep up operations until about January 20. When the mill does shut down, several months will be spent in the annual repairs upon the factory, so that all may be in readiness for an early spring opening. The present year has been quite a successful one, and the output well up with those of previous years.

## Blasting Stone by Elecrticity

At many large operations where considerable blasting is carried on to break down the material, it will be found that most of the blasting is done by means of electricity. In order to eliminate the human element as far as possible, the larger operations have adopted the use of "power circuits." This may consist of either direct or alternating current, although we consider for blasting purposes that the former is the better. The wires are strung on poles around the quarry in such manner as to be easily accessible from the point where the blast is to be made. On various poles wires are run down from the main power line to a small box attached permanently to the pole. From these points the blasts are made. Two up-to-date and satisfactory methods used are as follows:

At the quarry of the Solvay Process Company, Sibley, Mich., a switchboard is used. This consists of a board to which is attached two wires with a plug, two 100-ampere fuse plugs, two binding posts to which the lead wires from the blast are attached, and a knife switch.




In making connections of the electric blasting cap wires to the lead wires, care is taken to see that the lead wires do not at any point come in contact with the ground so that there will be no chance of electric leakage at the connections. The electric blasting caps are connected to the lead wires either in parallel or parallel series which is splendid practice where power circuit is used. After each electric blasting cap is loaded in the bore hole and again when all are connected to the lead wire, they are tested by the Du Pont Galvanometer to determine that everything is alright electrically.

When all is ready, the lead wires are connected to the binding posts, the plug is inserted in the socket in the "shooting box," and then the blast is made by closing the switch. After the blast the plug is removed and the lead wires are disconnected.

This makes a cheap but very efficient arrangement of making blasts and is one that is along the "Safety First" idea.

Another good method is one that is followed by the Michigan Limestone & Chemical Co., Rogers City, Mich. At this quarry they use a box, instead of a board, in which the switch is enclosed. This box is always closed and locked, when not in use, the key being carried by the blaster.

## American Concrete Pipe Association

We are going to have a red-hot meeting in February—not as long as some have been—but we hope that more ground will be covered in two sessions than formerly was covered in three, writes J. H. Libberton, Secy., American Concrete Pipe Association, 210 South La Salle Street, Chicago. A banquet will be held on the night of the 8th and the meetings on February 8 and 9 at the Hotel Sherman, Chicago.

Much important business is to be taken up at this time. A plan is being prepared for expanding the activities of the Association and this will be presented to the members at that time. A single attempt during the past year to get concerted action on the part of the Association in obtaining better freight rates has shown the need for much more compact and business-like organization. At the last minute, members were notified and some came in and did excellent work with the Classification Committee. Such committee, however, should be at work at all times, and we should never be caught unawares on matters of this nature. Only by special effort were we able to retard the action on the Western Classification Committee until our forces could be assembled.

The advantage of national advertising on the part of the Association, carrying continual advertisements and editorials in the national farm papers, and the like, are hoped for in the future. To do this we need new members and we need more money. One of two things will have to be done—each member will have to pay more money or we will have to get much bigger membership.

With the third issue of this bulletin, a complete list of members was given. You are well aware of the other tile manufacturers in your community who are not members of the Association. Get out that old list and check it over. See if you cannot get a new member or two. Remember they are $10 apiece.

One other feature of the convention will probably be a live wire from Washington or somewhere else, to tell us about the national aspect of drainage at the present time. A symposium on the advertising schemes of the various members will probably be staged. Come yourself and influence all of your other tile manufacturer friends to come in.

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## Link-Belt Rope Tramway

Pamphlet No. 343 of the Link-Belt Co. describes the Watson Type Tramway & Tower System, which has the following advantages over other systems:

1. Ease of operating. No lever system—all electric.
2. Power Saving—by use of counterweighting system.
3. Saving on Ropes.
   a. No slapping of loose ropes.
   b. No running of ropes through bucket sheaves when racking trolley.
   c. Short length of ropes from carriage to bucket.
   d. Two less ropes for hoisting.
4. Ease in changing buckets.
5. Time saving.
   a. Lowering bucket locked open.
   b. Racking and hoisting at same time with bucket locked open or closed as desired.
6. Simplicity of hoisting and racking machine—no friction clutches or brakes.

A copy of the booklet can be secured by writing to the Link-Belt Co., Chicago.

## Producing a Concrete Stone that Will Not Craze

Surface cracks or crazing in concrete are matters which have long vexed manufacturers of concrete stone and I believe I am safe in saying, with our present knowledge and methods of manufacture, they are a feature which can never be absolutely eliminated. With proper care and surface treatment, however, I believe that crazing, while it can never be absolutely eradicated as long as the concrete is exposed to the elements, can be overcome to such an extent as to render it practically unnoticeable.

Crazing is apparently caused by changes in temperature, resulting in uneven expansion and contraction on the surface as compared with those portions nearer the center. In making concrete stone a thin skin of cement mortar is formed on the surface which is much richer in cement than that forming the body of the concrete.

These two materials have different co-efficients of expansion and, because of this fact, varying changes in temperature cause "hair cracks" to appear. These are particularly marked on a surface which has been troweled to any extent, thereby bringing an excess of cement and finer materials to the top. On a surface treated in this manner, the crazing appears more rapidly and to a much greater extent.

Structurally these cracks are practically harmless, since they seldom extend into the stone more than 1/32-inch; but when they become full of dirt, as they invariably do, they result in a very unsightly appearance.

Crazing, when it has once occurred, is most difficult to rectify by anything short of removing the entire surface. The writer has completely removed all crazing from concrete stone with wire brushes, only to have the same cracks appear in the same place in two or three days' time. I have also applied a fine mixture of beeswax, paraffin and benzine to the surface when they are absolutely dry. This mixture does not discolor the stone and penetrates to the depth of about ½ in. This treatment, however, is at best only temporary and but postpones the evil day when the crazing appears.

I have also found that crazing varies inversely with the size of the aggregates and that, in general, the finer the ingredients used in the concrete, the more decided is the crazing. It is also true, so far as concrete stone is concerned, that crazing is to a certain extent governed by the finish used. For instance, a rubbed surface will show the crazing much more than a tooled or fine-axed finish; and with a coarse crandalled or point finish it virtually disappears so far as is apparent to the eye.

The only permanent remedy, which while it does not entirely eliminate crazing, reduces it to such an extent as to render it unobjectionable, I have found, is to remove completely the thin skin of cement from all exposed surfaces. This may be done in various ways and either while the concrete is still green or after it becomes hard. While the concrete is still green it may be washed with a thin solution of hydrochloric acid and then rinsed off with clear water, or the surface may be cut down with hand scrapers or wire brushes. These methods, however, have been found to disturb the aggregates and the final result is not so pleasing as may be secured if this thin skin is removed after the stone becomes hard. There are various methods in vogue for re-cutting this surface, the most practical of which I have found are either by means of sand blast, carborundum machines, or pneumatic tools. These two latter methods entirely remove the surface skin and expose the aggregate, thus greatly improving the appearance of the stone. Unfortunately, this treatment is rather expensive and but a small percentage of concrete stone users are sufficiently educated, or conversant with conditions, to appreciate the superiority and necessarily higher cost of a stone treated in this manner.

H. P. Warner,
President, Onondaga Litholite Co., Syracuse, N. Y.

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## Engineering Company Forms Partnership

Richard K. Meade, Consulting Chemical and Industrial Engineer, Law Building, Baltimore, Md., announces that he has formed a partnership with Mr. Howard C. Tompkins, one of his associates, under the name of Richard K. Meade & Co. This partnership is formed with the idea of strengthening the designing and construction department of Mr. Meade's organization which has during the past two years designed and supervised the construction of chemical and industrial plants costing over $750,000. Among the latter are complete plants for lime and hydrated lime, for potash recovery by the Cottrell system from cement kilns, for plaster, pulverized coal and various chemicals and additions and improvements to portland cement plants. Mr. Tompkins is a graduate of Cornell University (1903) with the degree of Civil Engineer and has had many years experience in the design and construction of cement, lime, plaster and chemical plants; in steel and reinforced concrete work and in industrial engineering generally. The firm maintains complete laboratories for the analysis and testing of engineering materials and for the development of chemical processes on a semi-commercial scale. A specialty is also made of reports upon processes, mineral properties, manufacturing and mining propositions, etc. Mr. Meade will as heretofore give his personal attention to all work entrusted to the new firm.

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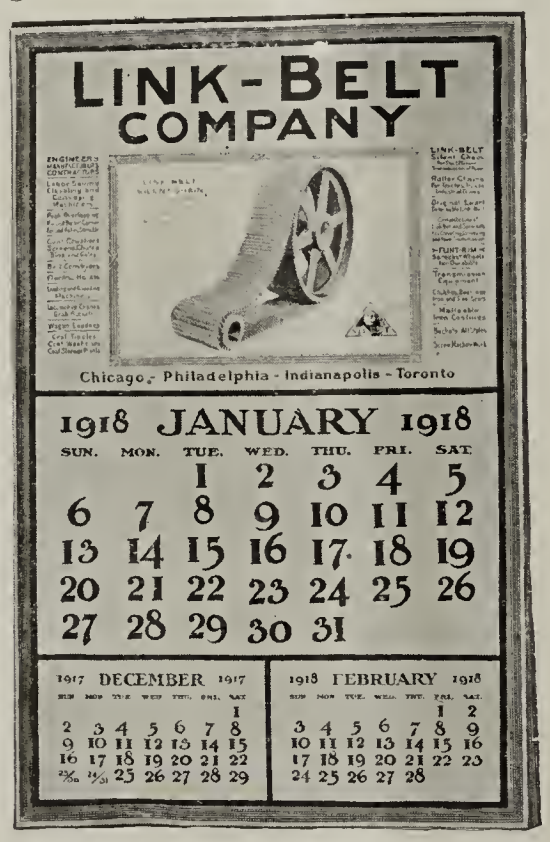
## Concreting a 2,000,000-Gal. Reservoir

A 2,000,000-gallon reservoir for the water supply of Huntington, Va., consists of two twin basins excavated in hard clay and gravel forming exterior embankments, with inside slopes of 1½ on 1 and a bank of 13½ ft. The bottom and sides are covered with a 6-in. layer of 1:2:4 concrete reinforced by wire mesh and finished with a ½-in. coat of 1:2 cement mortar.

Concrete and mortar were mixed in a gasoline machine mounted on a truck and delivered to a chute supported on light movable trestles down the slope to the bottom of the reservoir, where it discharged into wheelbarrows by which they were distributed as required. The 4-in. mesh reinforcement was at first supported clear of the bottom, at the required position, but later it was found more satisfactory to place it on the bottom, deposit part of the concrete over it and then pull it up to required position and embed it in the finished slab. The first basin was made with the inclined slabs up to a height of 4 or 5 ft., as far as a man could reach, monolithic with the bottom slab. This left an undesirable horizontal joint around the sides. In the second basin this was eliminated by concreting the sides in transverse strips 3 ft. wide extending from the bottom to the top and working from a ladder laid on the slope in advance of the concrete and moved as the latter progressed. The contract price of the reservoir was about $12,000.

## Link-Belt Company's New Calendar

Below is a reproduction of the first page of the Link-Belt Company's 12-sheet calendar, which they are distributing. The calendar is printed in three colors,




contains 12 sheets with a separate illustration on each page, and is approximately 16″x25″ in size. Write the Link-Belt Company, 39th street and Stewart avenue, Chicago, for a copy.

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## Gravel and Crushed Stone

There have been quite a number of tests made on the comparison of washed gravel and crushed rock. About ten or fifteen years ago, when I was engineer of bridges of the District of Columbia, there were several such tests made by our cement testing department. My recollection is that the gravel indicated a pressing strength of 80 per cent or 85 per cent of gneiss rock concrete.

I was called in as an expert on a small dam, half way between Washington and Baltimore—I don't remember the exact location—where a very dirty gravel sand (unscreened) was used and which never set up, but while the aggregate was dirty, I believe there was not very much cement used.

The principal trouble with dirty gravel—and in fact, dirty sand—is that it retards the set. In two dams we had trouble because the frost got into the concrete before it set. In one case after about two or three months the concrete in January was so soft that it could be pulled out by hand. In fact, in order to keep a small chunk intact it was necessary to wrap it up in absorbent cotton. The piece brought to the office, where the temperature was 70 degrees, set up in a few days and in a month was as hard as any concrete; that in the field set up the next spring and has never given any trouble.

Some years ago I built a foundation and superstructure, using a very dirty sand. In the foundations we used as high as 16 per cent of silt in the sand and used an excess of cement in the mixture, 1 : 2 : 4. The abutments were of the gravity type, liberally designed, and rested on sand with a safe carrying capacity of about 3½ tons. It was manifestly unnecessary to have a very strong concrete. The superstructure consisted of plate girders having a uniform depth of 9 feet and average spans from 60 to 90 feet. In some parts of this work the contractor used, as nearly as I could tell, a sand containing from 10 to 12 per cent of silt, whereas the specifications and rulings limited this percentage to about 6 per cent. Even then I do not believe that any trouble would have resulted had the concrete for this jacketing work been placed uniformly along the girder (longitudinally). The work was done by dumping at either end of the long girders, the concrete flowing towards the middle of each girder and being rammed so as to flow under broad flanges, which were, I think, 16 inches wide. Incidentally, the forms had been built around the girders to within 1 foot or so of the top. The result of the dirty sand and the method of placing was that a mixture of silt and cement, washed from the concrete, was carried under the flanges, whereas coarser material was restrained from going under on account of the narrow opening between bottom flanges and the form lagging. When the forms were removed, it was found that the material under these flanges consisted of a very light mortar made up largely of fine sand, silt and cement. It was necessary to remove all the concrete from the flanges and replace it by a good quality of concrete, at a cost of several thousand dollars. It would have been much cheaper, of course, to have used a clean sand and to have placed the concrete uniformly along the girder rather than at two ends.

Yours truly,

W. J. Douglas,

Care of Barclay, Parsons & Knapp, Engineers,

New York, N. Y.

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## Why Specify "Sharp" Sand?

By R. L. Martin, Ocala, Florida

Because "sharp" sand is hard sand. The fact that it is "sharp" is evidence that it is hard. "Round" sand is soft sand. The fact that it is "round" is evidence that it is soft.

All sands during the ages past, on an average, have been subjected to about the same amount of abrasion. "Sharp" sands, on account of their hardness, have withstood this abrasion and are still "sharp." "Round" sands, being soft, the sharp points and edges have worn off. "Sharp" sand being hard, wears longer than "round" soft sand when used in the construction of roadways, pavements and sidewalks—at least twice as long.

The grains of "sharp" sand have flat sides and sharp angles; they fit flatly against each other, and assist the cement in supporting weight; the angular grains themselves supporting part of the weight. When "round" sand is used, all the weight comes on the cement.

For example: make a conical pile of round grapeshot, and a similar size and shape pile of broken flint rock; step on the pile of round grapeshot; it flies in pieces in every direction; but step on the pile of angular rock, and it supports your weight. Just so with the "round" sand and the "sharp" sand. Add cement to these and in the case of the "round" sand all the weight comes on the cement, but in the case of the "sharp" sand the flat and angular construction of the grains assist the cement in supporting the weight. Concrete made with a given proportion of cement and "sharp" sand will support sixty per cent more weight than concrete made with the same proportion of cement and "round" sand.

Another reason why "sharp" sand is specified, is the flat sides and angular sharp points and edges of "sharp" sand fit more closely together than "round" sand; there are less voids in the "sharp" sands, and it requires less cement to fill the voids and make a solid stone than when "round" sand is used. Fifteen to twenty-five per cent less cement can be used if the sand is "sharp," than if sand is "round," and obtain same strength concrete.

# Using Dynamite in Excavating Creek Gravel

By J. U. Bradley.

There is a plentiful supply of excellent gravel for making concrete and for road surfacing purposes in a creek bottom near Hazelwood, Indiana. The creek is about 100 feet wide, and the best gravel is obtained from the creek bed where the flowing water has washed out the foreign material and sediment, leaving the gravel clean and free from dirt.

Since the excavation must all be done under water, a good, heavy drag chain with buckets attached is dragged across the bottom, bringing the gravel up and dumping it. It was found that at a depth of about 6 feet there was a layer of hardpan in which the buckets would jam, and stop operations for some time until they could be loosened. This hardpan was about 18 inches thick, and was underlain by good gravel, but as the buckets would not penetrate it, only the gravel above the hardpan was used.

Though not in charge of the work, I suggested that I be allowed to try the effects of dynamite for loosening the chain and buckets after they had become jammed in the hardpan about 6 feet under water. Accordingly, I obtained some Red Cross dynamite and made up several one-cartridge primers with a cap, and about a foot of fuse for each cartridge. These were lighted and dropped into the water at 10-foot intervals along the chain, while at the two ends, where the hardpan seemed to be the strongest, two cartridges tied together were used.

The machinery was then started up, and the chain was found to be free, the buckets coming up full. The blasting had not only loosened the chain and buckets, but had broken up the hardpan and loosened the gravel, so that every bucket worked to capacity. During a timed four-hour run immediately after the blasting, 40 cubic yards more of gravel were excavated than had ever been done in a similar period before. This showed conclusively that the job could be handled more economically by using explosives, and that the underlying gravel status could be rendered available for use.

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# Insuring Maximum Strength of Concrete Pavements

It is poor business to build with concrete and not take the necessary precautions to insure maximum strength. Good concrete can be made without difficulty if a few simple rules are followed.

Good aggregates, water not to excess, and proper mixing, are necessary. In addition, particularly in concrete road work, careful attention should be given to curing; that is, that the concrete shall not be permitted to dry out too fast and not be put into use before it has gained sufficient strength to carry its loads safely.

It is especially important during hot, dry periods that newly laid concrete shall not remain exposed to sun and wind. When it has hardened sufficiently, it should be covered with a canvas and kept wet. As soon as sufficient hardness has been attained by the concrete, the canvas should be removed and the pavement covered for two or three inches in depth with sand or earth and kept moist for seven to ten days, after which it should be allowed to dry out for a period not less than ten days before traffic is permitted to go upon it.

Most cities have ordinances providing penalty for using a street that is under construction before it is thrown open to traffic. All cities should enforce these ordinances as is done in New Castle, Pa., where a driver was arrested recently for driving upon a concrete pavement before the specified time had elapsed for opening it to traffic.

The injury that may be done by a heavy load to newly laid concrete is not always immediately apparent, and, in fact, there is often no surface indication at first to show that any harm has resulted. But after the pavement has been in use for a few months and repeated heavy loads have gone over it, the weakened condition of the concrete is disclosed and makes expensive repairs necessary.

Engineers should insist upon good aggregate, water not to excess, proper mixing and careful curing.

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# Creek Gravel Excavation

By J. V. Bradley

There is a plentiful supply of excellent gravel for making concrete and for road surfacing purposes in a creek bottom near Hazelwood, Indiana. The creek is about 100 feet wide, and the best gravel is obtained from the creek bed where the flowing water has washed out the foreign material and sediment, leaving the gravel clean and free from dirt.

Since the excavation must all be done under water, a good, heavy drag chain with buckets attached is dragged across the bottom, bringing the gravel up and dumping it. It was found that at a depth of about 6 feet there was a layer of hardpan in which the buckets would jam and stop operations for some time until they could be loosened. This hardpan was about 18 inches thick and was underlain by a good gravel, but as the buckets would not penetrate it, only the gravel above the hardpan was used.

Though not in charge of the work, I suggested that I be allowed to try the effects of dynamite for loosening the chain and buckets after they had become jammed in the hardpan about 6 feet under water. Accordingly, I obtained some Red Cross dynamite and made several one-cartridge primers with a cap, and about a foot of fuse for each cartridge. These were lighted and dropped into the water at 10-foot intervals along the chain, while at the two ends, where the hardpan seemed to be the strongest, two cartridges tied together were used.

The machinery was then started up, and the chain was found to be free, the buckets coming up full. The blasting had not only loosened the chain and buckets, but had broken up the hardpan and loosened the gravel, so that every bucket worked to capacity. During a timed four-hour run immediately after the blasting, 40 cubic yards more of gravel were excavated than had even been done in a similar period before. This showed conclusively that the job could be handled more economically by using explosives, and that the underlying gravel stratum could be rendered available for use.

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# Unfilled Orders Keep Cement Plant Busy

Almost a full season of full-blast operation is in prospect at the plant of the International Portland Cement Company at Irvin, east of Spokane, Wash., where approximately 50 men are steadily employed.

Not since the resumption of operations last spring after the customary shutdown has there been a period of inoperation at this plant, and, according to information today, business is in sight that practically assures the keeping of the mill in operation until late in the season.

# *Santa Fe Railway Laying Concrete Pavement*

By Con M. Buck, C. E. Mem. A. S. C. E. Division Engineer, Santa Fe Railway *

The Santa Fe Railway is constructing about two and one-half miles of concrete roadways of twelve, ten, eight and six foot widths in their shop and storehouse yards at Topeka, Kansas, to be used for trucking and hauling of storehouse supplies to and from storage and shops, also from shops and storage to cars for loading line shipments. The roadways will also serve as fire roads.

After making a study of the hauling and trucking conditions, which included a series of tests of the performances of an electric truck loaded and unloaded, with and without trailers under load, and moving over earth, oiled cinders, wood and iron roadways, the store department found the greatest economy would result by the building of a system of concrete roadways. Accordingly, plans and estimates were submitted and authority was received to construct these roadways, consisting of 10,706 square yards of 12-foot widths, and 3,490 square yards of lesser widths, a total of 14,196 square yards of concrete, together with 89 track crossings over main and switch tracks in the yards.

These roadways are being built by company forces.

Concrete Roadways in Railroad Yards

All side forms are set to line and grade as established by the engineering party. Any surplus dirt is then thrown out and subgrade dressed carefully to the bottom of the 2″x6″ used for side forms. As most of these roads are located where cinder roads now exist, there is a good, firm subgrade which requires no tamping. Where possible, the excavated dirt is used against the shoulder and the excess is then carted away.

The roadways are of one-course construction 6 inches thick. Standard portland cement meeting specifications of the American Society of Testing Materials is used. The fine aggregate is clear, sharp Kaw river sand, taken from the river at Topeka and delivered at the work in cars. The coarse aggregates consist of clean crusher-run Garnett stone, one and one-half inch maximum size, from which all fine screenings have been removed. This rock is also delivered in cars.

The time of mixing is 1½ minutes and the mixer delivers the concrete to its position in the roadway, where it is evenly spread and struck off with a template, a ½″ crown being given the surface and finished with a wooden float.

The slabs are reinforced and expansion joints are placed 30 feet apart, composed of two thicknesses of tar paper, held in place by a steel plate which is removed as soon as the concrete has been placed ten feet in advance of the joint.

Where side entering roadways are of materials other than concrete, an angle iron ⅜″x2″x2″ is placed and anchored on the edge of the concrete roadway in such a manner as to protect the top corner from being broken away by the traffic.

Where the roadway crosses the main line the crossings are constructed with 12″ of concrete upon which is placed a sand cushion and a brick surface. The flange ways are made by using angle iron of ⅜″x2½″x2½″ section, the bottom leg resting upon the concrete blocking with its outer edge against the web of the rail. The angle is drifted to ties by bolts driven through holes drilled in the lower leg, thus giving a flange way of 1¾″. On account of the small wheels on the truck, it is very desirable to have as small a flange way as possible to lessen the jar to trucks and loads when passing over the crossings. On the side track crossings the construction is wholly of concrete. The angle irons for the flange ways are placed and anchored and woven wire reinforcement is placed between the flange way guards and outside the rails to the end of ties. The concrete is run to surface even with the top of rails. The details of this construction are shown in the drawing of the sections of roadway and track crossings.

As previously stated the work is being carried on by company forces and is under the supervision of W. C. Hunt, traveling storekeeper, to whom much of the credit for the adoption of concrete and for the careful execution of the work must be given, with H. Allison as foreman. The engineering field work is in charge of F. T. Morse, transitman.

That portion of the work which is in service is highly satisfactory, and the character of the traffic passing over the roads can be seen in the photograph which shows electric trucks and trailers, hand trucks, and horse drawn wagons. Nine electric trucks are now in service, and the horse drawn wagons will be gradually supplanted as more trucks and tractors are being ordered.

*In the Railway Maintenance Engineer.

## Rates on Sand, Gravel and Crushed Stone

The board of railway commissioners for Montana announces a special hearing at Helena to consider:

Application by the Northern Pacific Railroad to advance rates from 3 to 3½ cents per hundred pounds from Moncrete, Mont., to Butte.

To advance rates on lime rock 50 to 55 cents per ton from Lime Spur to Butte.

To advance rates on lime rock $1 to $1.45 per ton from Lime Spur to Billings.

Hearing upon initial motion of commissioners as to reasonableness or otherwise of the rate in effect of 3 cents per hundred pounds on crushed rock from Logan to Bozeman.

# *Potash as a By-Product of Cement Mills*

By Richard R. Mead, Engineer, Baltimore

The writer pointed out the loss of potash by volatilization from the rotary cement kiln as far back as 1903, and similar loss from the blast furnace has been noted even before this. Nothing, however, was done toward collecting from either source prior to 1914, although various suggestions along this line were made.

Some ten years ago a fight arose between the orange growers in Southern California and the cement mills over the question of the damage done by the dust from the cement mills which settled on the trees and fruit. To prevent further dispute, the Riverside Portland Cement Company, Riverside, Cal., installed a process for precipitating the dust by means of an electrical system invented by Dr. F. G. Cottrell, now of the Bureau of Mines. This process proved not only efficient as a dust-catching device, but also collected the potash with the dust, the result being a mixture of dust and potash, the former being in very much the greater quantity. This potash is most of it water soluble, and if the dust is leached with water, potash will dissolve out of it, and may thus be separated from the dust.

The quantity of potash volatilized and escaping from a cement kiln is directly proportional to the amount of potash in the raw materials, other things being equal, and amounts to about half the potash fed into the kiln. At Riverside prior to the war the raw materials were low in potash, and hence the amount volatilized was small. After the outbreak of the war the Riverside company found they could increase the output of potash from their kilns by mixing with the latter feldspar, which can be done without injury to the cement. It was also found that by mixing fluorspar with the raw materials the amount of potash volatilized was increased from 50 to 90 per cent of the amount in the raw materials. They next extracted the potash from the dust, crystallized the same and thereby secured a potash salt containing at least 35 per cent potash.

The crust which collects in the stacks of the rotary cement kiln contains from 6 per cent to 12 per cent potash, and since 1914 large quantities of this have been sold to the fertilizer companies. The Security Cement & Lime Co., at the instigation of their manager, Mr. J. J. Porter, installed and put in operation in the summer of 1916 the Cottrell process, with a view to catching all of their kiln dust. They have found that by adding salt to their raw materials they obtained a greater amount of potash, and it is now their practice to do this. At the present time they are obtaining about 20 tons of dust per day, averaging 10 per cent, water-soluble potash. This installation has long since paid for itself, and the annual profits would represent several times the original investment.

The Santa Cruz Portland Cement Co. are now recovering 700 pounds of potash daily from their kilns by a secret process of their own.

Among cement companies who are installing or have installed the Cottrell system for recovering potash are the Whitehall Portland Cement Co., Cementon, Pa.; the Coplay Cement Manufacturing Co., Coplay, Pa.; the Dexter Portland Cement Co., Nazareth, Pa.; the Clinchfield Portland Cement Corporation, Kingport, Tenn.; the Ironton Portland Cement Co., Ironton, Ohio, and the Alpha Portland Cement Co., Cementon, N. Y. When these plants are in operation the total potash recovered from this source will approximate 10,000 tons annually.

The Buffalo Potash & Cement Co., Buffalo, N. Y., is to operate under patents granted to H. G. Brown, who proposes to fuse together limestone, feldspar and calcium chloride in a metallurgical furnace. Potassium chloride is given off as a fume, which is to be collected by a Cottrell treater. A slag is also obtained, and it is proposed to make a superior slag cement from this.

I estimated that there are now volatilized from the cement kilns of the country approximately 72,000 tons of potash per year. At $80 a ton, the pre-war price (equivalent to $40 for muriate), this would represent a value of $5,760,000. It is further possible to very greatly increase this quantity of potash by using some feldspar as a raw material.

The only objection to installing the Cottrell system is the cost, which in the case of the average-size cement mill would run somewhere around $100,000. Improvements are now being undertaken, however, in the system which it is believed will greatly cheapen it. To equip all the plants in this country for potash would cost approximately $10,000,000.

While the first cost of the system is high, the cost of operation is very slight, and the potash can unquestionably be collected for much less than it could be obtained from Germany before the war.

# *Concrete Culvert Construction*

Fairview, Major County, Okla.—The methods employed in concrete culvert construction and the costs of the work completed within the last fiscal year in our county are perhaps of interest to those engaged in the same line of work.

In order to standardize, as much as possible, the work of construction, we have come to using either 4-foot or 8-foot wing walls on most of our culverts. In this way we are able to make up our forms as two pieces for wing walls, and if an 8-foot wall is desired we use both sections, or only one section for a 4-foot wall.

Lumber forms are used for all walls and wings, while for floor slabs and arch rings we use No. 16 galvanized iron sheets cut into 9-inch strips each 10 feet long. One edge of the strip is bent up for 2 inches, making the effective width only 7 inches, so that 2 inches will act as an angle iron so that it will fit over a joint in making the forms for a flat slab culvert, and the angles fit into notched wooden centers for arch culverts. The wingwall and head-wall forms are made from flooring. A gasoline mixer is employed on all work.

The labor for all our work is paid on the following schedule: Foreman, with horse and buggy, $4.50 per day; one man with team is $4.50 per day, and four men at $2.50 each per day. The men board themselves out on the job and use the foreman's horse and buggy for securing groceries and other supplies needed. The other team is used for hauling cement from storage, re-

moving excavation, hauling water and moving the entire outfit from place to place.

Aside from two large concrete bridges which were built by contract, we built 1,237 cubic yards of concrete culverts at an average cost of $12.09 per cubic yard, which includes all labor and material. The costs average on a cubic yard basis as follows: Labor, $3.45; moving paid for in addition to the bridge gang, 26½ cents; form lumber, 32½ cents; mixer, tools, wire, etc., 21½ cents. We used 6,880 sacks of cement at an average cost of 52 cents, with 8 1/5 cents for hauling. Rock for two-thirds of the culverts was hauled to the sites by contract, but broken by the bridge gang with sledges; sand was delivered to the jobs by contract.

A 1 : 2 : 4 mixture is used for slab construction, a 1 : 2½ : 5 mixture for the walls and wings, and 1 : 3 : 5 mixture for all arches.

All culverts which have been built in the county are in excellent condition and no cracks have been noticed.

The following paragraphs are devoted to a recapitulation of some of the laws relating to the performance of road duty and to the building of culverts and bridges.

All males between the ages of 21 and 50 are subject to call for four days' work of eight hours each year. A list of all persons affected by this law is made by the Supervisor on the first of January and July each year. The names are arranged alphabetically and are filed with the Township Clerk. When men are called for road duty the men are notified of the time and place of duty at least three days in advance. If a man brings a team with him and uses it in the work, he receives credit for two days' work for each one of actual service. Any man may become exempt from road duty by payment of $5 for the year. It is required that one-half of all road duty for one year be worked before the first of July and that the remainder be performed in the last six months, there being no provision for a man to let his road duty accumulate with the promise that he will work it in the next year.

The county commissioners build all the bridges and culverts on the state road system and the bridges on the township roads with a span of more than 20 feet, the township building all of 20 feet or less. All road structures must be built of a permanent material and must allow a clear roadway of not less than 16 feet.

This series of laws set forth with clarity the work of the various civil authorities and materially aid them in the proper pursuit of their duties. Not less than 10 per cent nor more than 15 per cent of the roads in the county are designated as state roads by the county commissioners, and they must connect towns and market places and connect with roads in adjoining counties. For the maintenance of state roads there is collected by the State Highway Department an auto license of 50 cents per horsepower.

Irvin B. Ramseier, County Engineer.

## Concrete Culverts in Kansas

There is a growing sentiment in Kansas that drains and culverts of wood and galvanized iron are too costly for a progressive State to tolerate. A movement originated several years ago in the State Highway Commissioner's department, with the object of building all new culverts of concrete. Much missionary work has been done among county road officials and township boards, and to-day concrete culverts are being installed all over the Sunflower State.

The township board of Delaware township, Leavenworth county, Kansas, consisting of M. J. Aaron, L. D. Harris and W. M. Sheeley, recently supervised the construction of a 24-ft. culvert which they claim to be the best and the cheapest in the whole county. They had had experience with culverts of wood that rotted out and collapsed, and with culverts of iron that rusted and failed. They investigated the concrete culvert, and found that while these cost more to install than wood culverts, and less than those of metal, yet, at the end of ten years, the actual cash outlay for concrete culverts was less than for any other type, as they involve little if any expense for maintenance.

Their first culvert was built 24 ft. long and 4 ft. in diameter, with 1-ft. retaining walls 18 ft. long and 9 ft. high. The wall of the culvert tube was 6 in. thick. The cost of the structure was as follows:

| | |
|---|---|
| 19½ bbls. cement, @ $1.80 | $ 35.10 |
| Sand, stone, and hauling | 42.30 |
| Labor on construction | 36.00 |
| Total | $113.40 |

The cost of a corrugated iron culvert, with the same wing walls, would have been $148.40.

## Sawyer Belting

The A. C. Ochs Brick & Tile Company of Springfield, Minnesota, recently wrote the Sawyer Belting Company of Cleveland, O., the following letter concerning their Sawyer stitched canvas belting, viz.:

"Our experience with it has been very satisfactory. We have used it on certain drives for more than ten years and are still using it wherever practicable, such as on our machines, pug mills, crushers, etc. It is very satisfactory—especially so when real rough usage is required."

Mr. Ochs' experience with Sawyer is not exceptional, but quite the contrary. Sawyer is good for Power Transmission, Elevating and Conveying, writes the Sawyer Belting Company.

The efficiency of your entire plant depends on the kind of service you get from the belting. If the belts slip or stretch—or don't run true on the pulleys, the machines can't give maximum production.

Our engineering knowledge and our quarter-of-a-century close contact with clay products, cement, crushed stone and gravel have enabled us to produce belting for every rock products factory.

## Concrete Highway Construction

The new pamphlet issued by the Atlas Portland Cement Company, New York, 8½x11 ins., 24 pp., enumerates essentials of a good highway. Gives illustrated general description of concrete road design and construction. Gives equipment and organization required. Gives itemized proposals for concrete road construction and tells how to fill them out intelligently.

# *Floor Surfaces for Concrete*

Floors get the most use and wear. Therefore, it is important that particular care be given to the selection of the proper floor surface. Good floors give lasting satisfaction, while poor floors provide a constant source of annoyance and afford inefficient working conditions.

The selection of the floor surface is dependent on the nature of the structure and also the kind of use to which the floor will be subjected. The principal items to be considered are the wearing properties, appearance and cost. The secondary items (very important, however, in structures used for certain classes of manufacturing) are cleanliness, weighth, strength and fire resistance. No one type of floor surface is suitable for all conditions. It is necessary to make a special study of each individual case.

There are many different types used, such as

Granolithic
Hardwood
Terrazo
Marble
Linoleum
Cork Tile
Composition
Asphalt
Asphalt Mastic
Tile (Mosaic)
Tile (Clay)
Wood Block

Of these the most common are granolithic and hardwood, and it is with these types and their construction that we shall deal principally in this article. The other classes will be treated briefly.

### Granolithic (Cement Finish)

The granolithic floor is, no doubt, more in keeping with the reinforced concrete building than the wooden floor. It has good wearing properties, presents a good appearance; it is a strong, sanitary form of construction, reasonable in cost. The finish is a part of the floor and adds to the strength of the slab. The total thickness of the floor is less than for wood, which means a less total height of building for the same clear story heights than where wood floors are used. This type gives more wear for factories and machine shops than a wood surface floor.

Among the objections which have been voiced against the granolithic finish is the complaint that these floors sometimes dust. It is true that such floors have sometimes dusted, but this is due to improper methods of construction and can be avoided by the use of proper materials and proper workmanship.

From the structural standpoint there are three classes of granolithic floors. (1) The concrete surface may be applied at the same time as the base, thus producing a monolithic floor, or (2) the finish may be applied later, or (3) the cement finish may be applied on a cinder concrete fill laid on top of the concrete base. The mortars to be used and the character of the aggregate are the same for all three.

It is very important to use only good material. Depending upon the exact nature of the construction, either one of two mixtures may be used. The first mixture is a mortar in the proportions of 1 bag Portland cement and 2 cubic feet fine aggregate ranging in size from $\frac{1}{16}$ to $\frac{1}{2}$ inch. The second mixture is a mortar in the proportions of 1 bag Portland cement and 1 cubic foot of fine aggregate and 1 cubic foot of aggregate for wearing course ranging from $\frac{1}{8}$ to $\frac{1}{2}$ inch, or even larger. A thicker coat must be used for the second mixture than for the first mixture.

In making the monolithic type, the base of the concrete floor, after being poured, is struck off to a level, so as to allow for a thickness of $\frac{3}{4}$ to 1 inch for the mortar finish. This is placed immediately and thus forms an integral part of the concrete floor. It has the advantage of being a one-piece form of construction and thus obviates the difficulty or danger of separation of the mortar finish from the base. The mortar finish is screeded to grade with a straight edge and smoothed with a wooden float and later finished with a steel trowel. This may be marked off into blocks or sections if desired, but it is not advisable.

In applying the finish after the slab concrete has set, it is very important to prepare the concrete base so that the mortar finish will adhere and bond firmly with the base. It is necessary first to roughen the concrete base thoroughly. All loose material and all foreign material should be cleaned from the surface. Next the concrete is thoroughly drenched, so that it will not absorb any moisture from the fresh mortar. It is then given a coat of grout, of cement and water, applied with a whitewash brush, and is then ready for the mortar finish.

The third type of a surface finish in concrete is that of laying cinder concrete on the concrete base before applying the mortar finish. In this method a cinder concrete is laid 2 inches thick on the reinforced concrete slab. It is screeded and then the surface finish, to a thickness of 1 inch, is applied immediately. For the purpose of obtaining a good finish the cinder concrete base may be allowed to set before the finish is applied, as it is often difficult on account of the porosity of the cinder concrete to obtain a good cement finish when the surface is placed before the cinder concrete has hardened.

It is highly important that the surface finish should be properly cured. Sprinkle the floor and keep it wet for at least five days. The floor may be covered with tar paper, on which can be placed a thoroughly wetted layer of sawdust. Trucking or heavy wear of any kind should not be allowed for at least two weeks.

### Hardwood

The main objection to a wood floor surface is the cost. Good maple flooring will run from 8 to 15 cents higher per square foot than the more expensive type of granolithic floor. Another disadvantage to be considered is the fact that a wood floor adds to the dead weight of the slab and reduces the effective story height. An objection that is sometimes made to wood floors where sleepers are used is that the sleepers dry rot and, especially if complete filling is not made with cinder concrete, the floors are liable to become springy.

In constructing a wooden floor there are two common types. The first is made with sleepers laid on the reinforced concrete slabs, and a filling between these of cinder concrete. The flooring is then nailed to the sleepers. The other method is to apply a sand and tar mixture to the floor slab, and then lay wooden planks and nail the maple flooring to the planks.

In the former type of construction, 2 x 4-inch sleepers, laid 16 inches center to center, are recommended. The sleepers are laid directly on top of the reinforced concrete slab and it is a good plan to drive 40d nails part way in the sides of the sleepers at intervals of about 3 feet alternately on each side. These nails are for the purpose of keying the sleepers with the concrete to prevent any movement. The sleepers are usually beveled at the sides, so that they may be better held to the concrete in case of shrinkage of the wood. There is a wide variation in the proportions of cinder concrete to be used, the average being 1 part Portland cement, 3 parts sand and 6 parts cinders. Sometimes planks are nailed upon the sleepers before the flooring is applied. When this is done the planks are nailed at right angles. The maple flooring should then be nailed at right angles, or diagonally on the planks. For ordinary floor construction, however, the maple flooring is nailed directly to the sleepers the thickness for maple flooring ranges from $\frac{7}{8}$ to $1\frac{1}{4}$ inches. Sometimes the

cinders are laid dry instead of being made into a concrete. The advantage claimed is that in such a construction there is less danger of dry rot.

In the other form of wooden floor construction the use of sleepers is avoided and a sand and tar base is applied directly to the reinforced concrete slab. The sand and coal tar are spread about ¼ inch thick and leveled off with a straight edge while still warm and soft. On top of this layer are placed 2-inch planks fitted closely together. The maple flooring is laid at right angles on the planks. Sometimes rough pine boards ⅞ inch thick are laid on the planks before the maple flooring is laid. This depends upon the type of the building and the load and amount of wear to which the floors will be subjected.

## Waterproofing an Integral Part of the Cement Mixture

The first successful waterproofing medium for integral use was brought out some ten years ago. It was a true invention, not an accidental discovery, and the courts have repeatedly upheld the claim of the inventor, Mr. S. B. Newberry, to originality in this field.

As everybody knows, concrete or stucco is porous. It absorbs moisture from the atmosphere and where water is present in large quantities, as is often the case underground, it acts like a lampwick.

It is practically impossible to make concrete dense enough to prevent the absorption of moisture. Mr. Newberry, who is the inventor of Medusa waterproofing, attacked the problem in a new way. He discovered a substance which when incorporated with cement would form a permanent compound that repels water. He found that only one and a half or two percent of this compound is needed to completely destroy the wick-like action of concrete.

The integral method of waterproofing is being used for subways, foundations, etc., below the level of rivers and lakes and with water in contact with the entire wall.

The use of the integral method involves no difficulty. Concrete is mixed and poured exactly as if it were unwaterproofed.

Another field which is being completely taken over by the integral method is that of stucco. The greatly increased use of stucco as an exterior finish is mainly due to the use of waterproofing. Waterproofing mixed with the stucco keeps it from drying out too rapidly, and thus prevents hair-cracking. The waterproofed stucco is non-staining and holds its original beauty and color.

## Building a Pre-Cast Reinforced Concrete Chimney

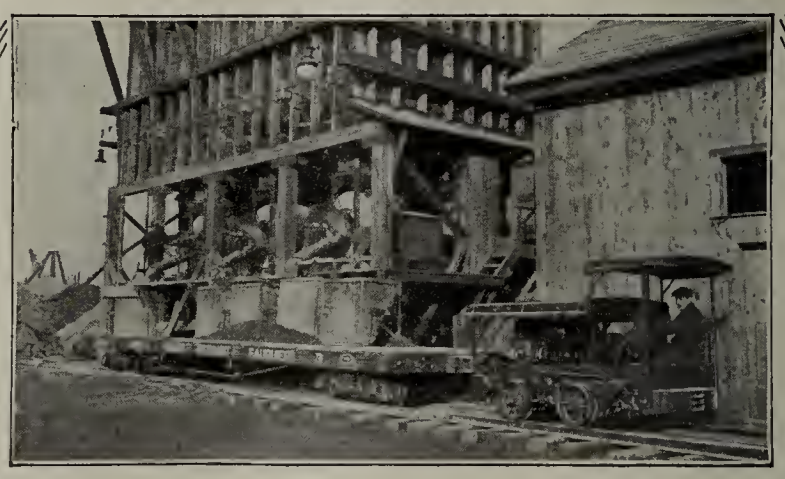
A chimney 135 ft. high with an inside diameter of 5 ft. 6 in. at the top and 10 ft. 2 in. at the bottom, and a fire brick lining 45 ft. high was recently built in the yard of the Canadian Pacific Ry. in East Toronto, Canada, for a total cost of about $3,000. The chimney was seated on an angular reinforced concrete foundation 20 ft. 6 in. in diameter and 6½ ft. high, to which it was bonded with anchor rods connected to the vertical reinforcement rods in each of the eight exterior corner pilasters.

Both the exterior and interior surfaces of the chimney were octagonal and the walls above the foundation were built in courses 4 in., 4½ in. and 5 in. high, each consisting of eight pre-cast reinforced concrete blocks, one end of each being hook-shape in plan and overlapping the corresponding ends of the next upper and lower courses provided with reversed hooks, and thus making continuous vertical chases in the pilaster that received continuous vertical reinforcement bars embedded in a solid mass of concrete.

Horizontal grooves were also moulded in the upper horizontal faces of the blocks to receive the octagonal reinforcement rods that were connected by stirrups to the vertical reinforcement. The blocks were cast on the job in metal forms by three men, at the rate of about 65 per day. They were laid at the rate of nine courses per day by two masons and five helpers working on an inside scaffold. The blocks were hoisted by a tackle, suspended from a tripod carried up with the chimney, passing through a hole in the foundation and operated by a gasoline engine located outside. The contractor, Edward Pelletier & Sons, Quebec, has the patent rights for the United States.

## Use Motor Trucks for Hauling Sand

The Ohio River Sand Company, Louisville, Ky., has been having so much trouble in getting cars promptly for transferring sand from its riverside plant to its branch hoppers that it recently started hauling sand for the branch hoppers with its big fleet of automobiles and has found that it really represents a saving to haul sand by gasoline, as the men have to be paid anyway, and it keeps things busy. Of course, when the trucks are needed in rush times for steady delivery runs the terminal company comes in very handy, but cars cannot always be had for loading when they are needed, and open cars are always hard to get.

The Plymouth Hauling Concrete for Foley Bros., Welch, Stewart & Fauquier

**"Saves Yard Haulage in Contract Work"**

**—Says McArthur**

Foley Bros., Welch, Stewart & Fauquier, general contractors, Halifax, N. S., have two Plymouths employed constantly in general yard switching and hauling concrete on the job. C. D. McArthur, chief engineer for this firm, found that—

**The Plymouth**
**Friction-Drive Gasoline Locomotive**
**Cuts Haulage Costs One Half**

It costs less to buy, less to install, less to operate, and less to maintain. It takes heavier loads up-grade, uses full power of motor in high or low speeds, goes at ALL speeds up to 12 miles, and moves quicker without jerk or jar.

*MR. McARTHUR PROVES ALL THIS*

"The Plymouth Locomotives are entirely satisfactory to us," he says. "We find them of great help in our yard work and we find it would be hard work to get along without them."

THIS BOOK TELLS

We have a book that tells the complete story of these contractors as well as other owners of Plymouths. It is also full of cost data and valuable information regarding haulage problems similar to your own. A copy for the asking—send for it today.

**THE J.D. FATE CO., 220 Riggs Ave., PLYMOUTH, OHIO**

The
# KENT

**A Specially Designed**

## Mixer for Products Plants

Seventy per cent of the bigger block, tile, brick and specialty concrete products plants of the country use the famous Kent Mixer.

Equipped with automatic feeding device, it makes certain a proper proportioning of aggregates and being continuous in operation, it saves time and labor. The biggest concrete products plant in the world has found that four Kent machines will mix fast enough to keep its many tampers and mold machines busy.

**Write today for descriptive literature and prices.**

## THE KENT MACHINE CO.
**Kent, Ohio**

*"Stonekote" residence at Hinsdale, Ill.*

## "Stonekote" Rough Cast

The only cement plaster for all exterior surfaces—rough cast, float coat, trowel finish, or polish finish. As hard as natural stone; made in ay non-fading color desired. Stonekote is shipped as a dry material; any mechanic can mix and apply. It is the only perfect waterproof and wear-resisting plastic finish to give permanent and delightful results.

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**Garden City Sand Co.**
25 North La Salle Street
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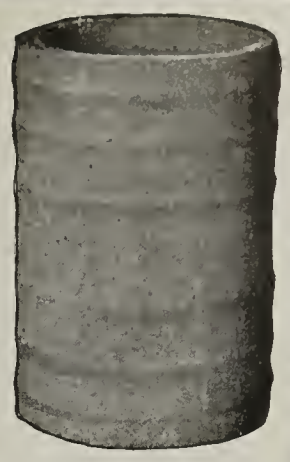
# The Biggest Tile Business on Record



Get action now. Big spring buying of drain tile will start soon—and it will be the biggest on record. Cement tile is needed wherever farming is done. Thousands more tile plants are needed to fill the demand.

Equipment must be selected and installed, manufacturing perfected, and a stock of tile made up—all within the next few weeks. Enlist our co-operation.

Dunn equipment is standard. It represents the minimum necessary investment, is sold on a strict guarantee to satisfy, and on **15 days' trial.** Ask for the book, "Cement Drain Tile"; we send it free.

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There is a constant demand the year round A demand that you can supply with just one set of our Steel Molds. Think how nice it would be to have a neat little income during the winter months and all the year round.

## The AUTOMATIC SEALING VAULT

pay big profits from fifteen to 24 dollars on each one. You can develop this as a side line or devote all your time to it. Make the dollars come in this winter by making the AUTOMATIC SEALING VAULT

The First Step is to send for information. We'll furnish full details and particulars. Write Today.

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**216 East River Street - - Peru, Ind.**

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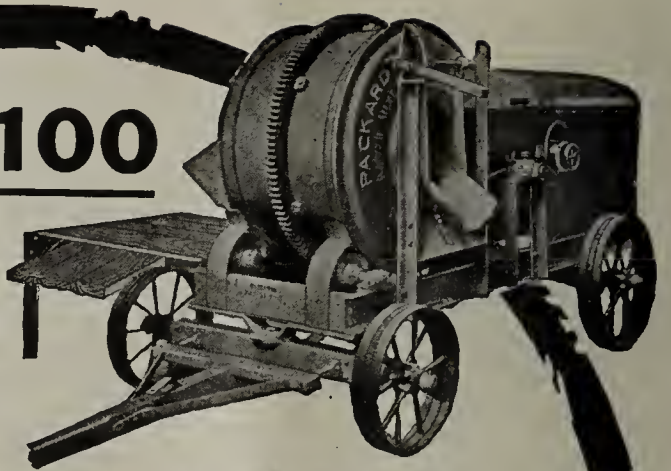
Boss Equipment "Doing Its Bit"

# Over 100 Boss "High Speed" Mixers Bought For Use On Cantonments and Fortifications




Low Chargers—Half Bag, One Bag and Two Bag Sizes

Used at Fort Sill, Oklahoma, by Selden Breck Constr. Co., St. Louis; Camp Pike, Arkansas, by Jas. Stewart & Co., Chicago; Minneaola Aviation Field, N. Y., by Clough-Bourne Corp. N. Y.; Camp Mills, N. Y. by Clough-Bourne Corp., N. Y.; Pelham Big Naval Camp, N. Y., by Henry Steers, Inc., N. Y.; Fort Oglethorpe, Ga., by Snare & Triest Co. N. Y. Also on harbor fortifications, New Orleans, Cleveland, Boston, Charleston.

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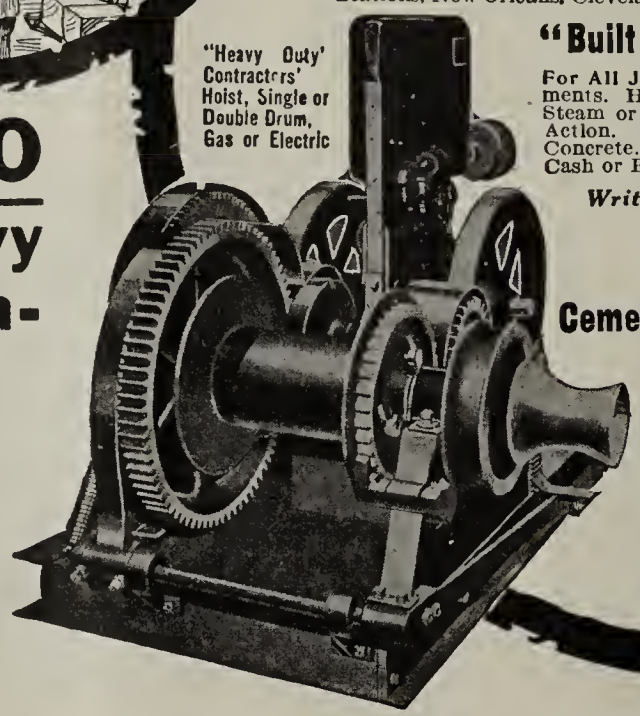

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**For All Jobs.** With Hyatt Self-Oiling Roller Bearings and all improvements. High Speed Mixers in all used sizes—4 to 22 ft. capacities. Gas, Steam or Electric Power. Patented High Speed Mixing and Discharge Action. Side or End Discharge. Mix Mortar and Plaster as well as Concrete. More than 4000 in use. Sold on "Money Back" Guarantee—Cash or Easy Payments.

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Building Mixer With Automatic Power Loader Measuring Water Tank

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# Over 100 Boss "Heavy Duty" Contractors' Hoists Ordered For Use in France

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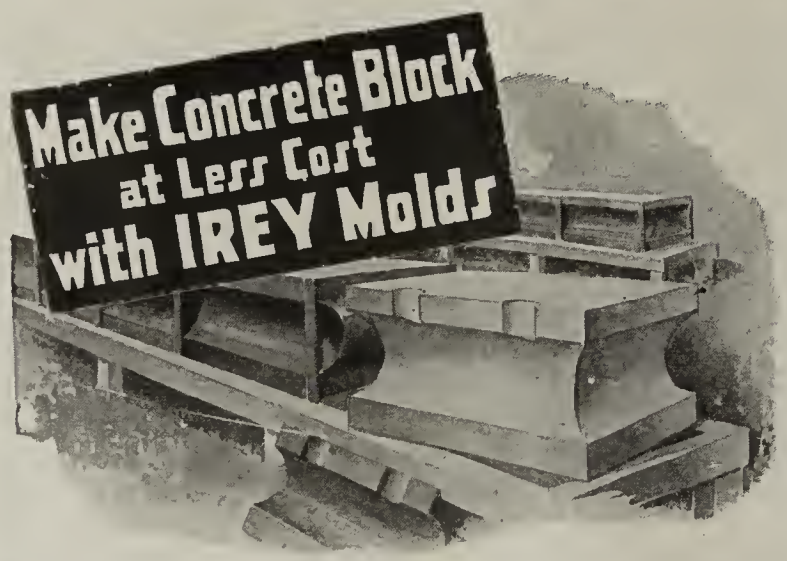

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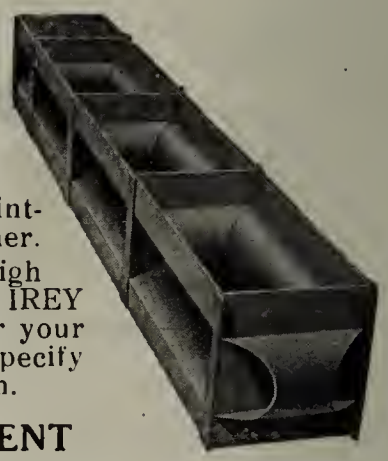
CONCRETE FOR A BUILDING BLOCK should be of the highest possible quality — that means it should have sufficient moisture to make it "pour."

IREY blocks are poured in low-cost metal molds. When they have cured, they are flint-hard and ring when struck with a hammer.

For speed and simplicity in making high quality concrete blocks, investigate the IREY molds. You will have no competition for your product. Architects and builders will specify your blocks immediately upon seeing them.



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Rights to manufacture or use will be sold to desirable concrete manufacturers. Write for terms. Biggest thing in concrete block field.

**JOHN H. IREY - West Liberty, Iowa**

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## A Handwheel On Each Side

Hand labor is expensive and hard to get. The Dunn Mixer does the work of several men, and does it better. Five big features assure a degree of mixing efficiency, rapidity and economy possessed by no other mixers of the popular tilting drum type. The Dunn machine has the discharge-from-either-side feature; the double-handwheel is exclusively a Dunn innovation.

In size and price the Dunn is just right, for average contracting. Easy to operate, economical to run. Built rugged enough to withstand the hardest usage. Write for Dunn Mixer Bulletin. Agents Wanted.

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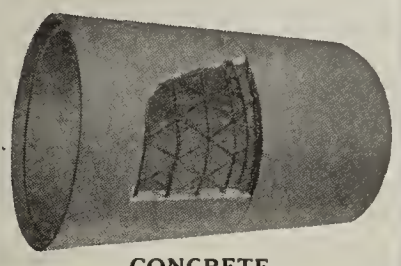
Save steel. Save wood. Build with everlasting concrete. Use more unskilled labor. Reduce railroad tonnage. Cut out delays.

"NORTHWESTERN" Tile and Culvert Forms—standard and special sizes—are used by the U. S. Government Reclamation Service for Storm and Sanitary Drainage, and by State, Municipal and County Road Officials everywhere.
Round or Elliptical Forms.

*Full instructions for making "NORTHWESTERN" CONCRETE TILE in BULLETIN No. 29.*



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Capital Stock, $200,000.00
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7000 THOUSAND SATISFIED USERS

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Just as good on the Little Job as on the Big Job

It shows a substantial profit on a little sidewalk job as well as on big construction work. it will cost you three cents an hour to run the Jaeger and you get a mix a minute.

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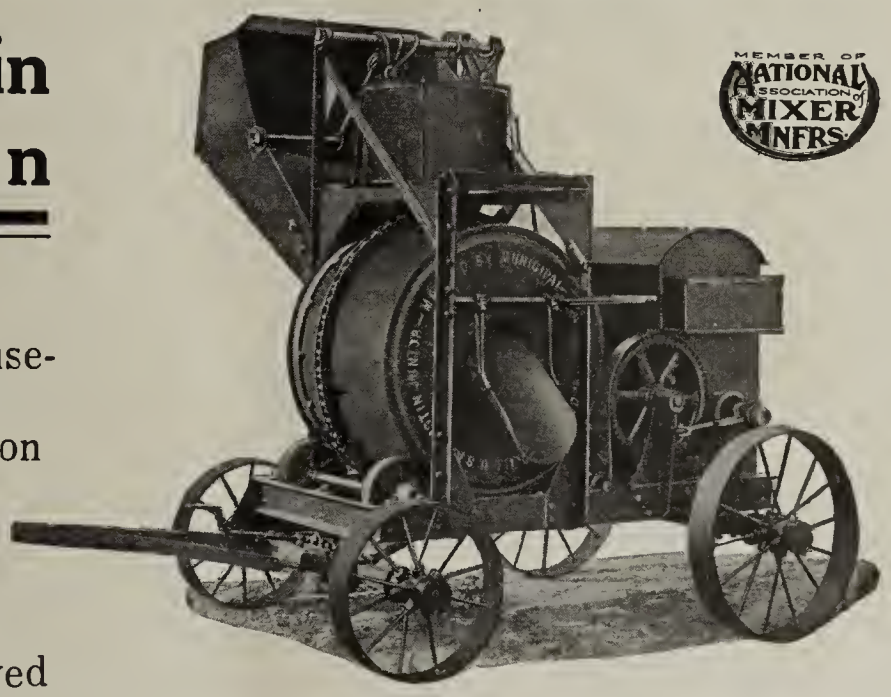

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Drum mixers are not new.

Drum mixer design permits of no particularly useful novelties.

Drum mixer merit is measured by quality of construction.

Austin Drum Mixers have the life and work producing quality distinctive of every product of the Austin factories.

Austin made mixers on the Panama canal showed an output life record never surpassed.

Some of them mixed over 225,000 cubic yards each and were still going strong when the work stopped.

You can't wear out an Austin Drum with work. Its purchase is a permanent investment.

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CALDWELL Silos practically sell themselves. They are storm-proof, water-proof, air-proof, acid-proof, fire-proof, vermin-proof — altogether, trouble-proof. Each stave is a wet mixed reinforced stave having $\frac{3}{8}$" bar of twisted steel placed diagonally in the concrete. And each stave interlocks with the six adjoining staves; is crossed and held in place by three external bands. Caldwell Silos are permanent, moderate priced and favorites with the farmers.

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## CIRCULAR MONOLITHIC CONCRETE CONSTRUCTION

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BUILD grain tanks, coal pockets, water towers, silos, silo-tanks. A postal will bring you valuable information. Start toward a bigger business today.

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We can meet your Reinforcing Steel Requirements. This means not only quick shipment from the mills but co-operative service for rapid transportation. If you want to know just what your exact cost will be, send us the Blue Prints and we will give you a lump sum bid on all the steel sheared to lengths, bent to specifications and delivered to the job,

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# The Waterloo Bar Bender will pay for itself on the first job

No. 2 Machine Bends to including 1⅛" Bars, weighs 110 lbs. Price.....$18.00
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The price of this bender is returned to you in time and money saved on your first job, and the machine itself is indestructible, so you multiply this saving year by year.

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***Reduce the repair account and Increase the tonnage.***

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May we send you our booklet telling of the Stroh Process and its achievements? You will find it intensely interesting and, we believe profitable also.

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RESULTS:—Increased Efficiency—Saving in Operating Cost.

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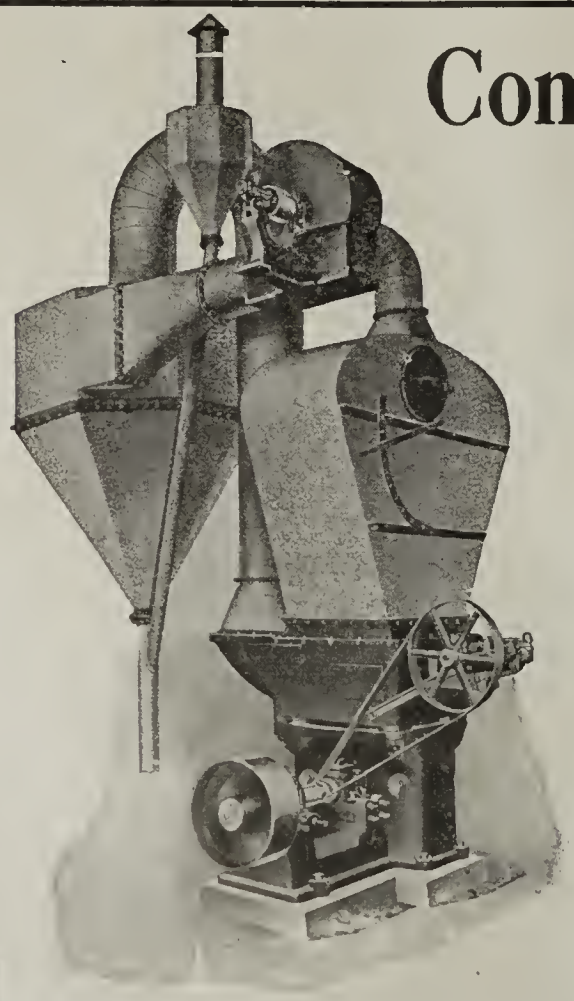

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### For CLINKER, LIMESTONE and COAL

THE LARGEST PRELIMINARY GRINDER BUILT

CAPACITY PER HOUR ON CLINKER

80 TO 120 BBLS. TO 20 MESH WITH 80—90 H. P.
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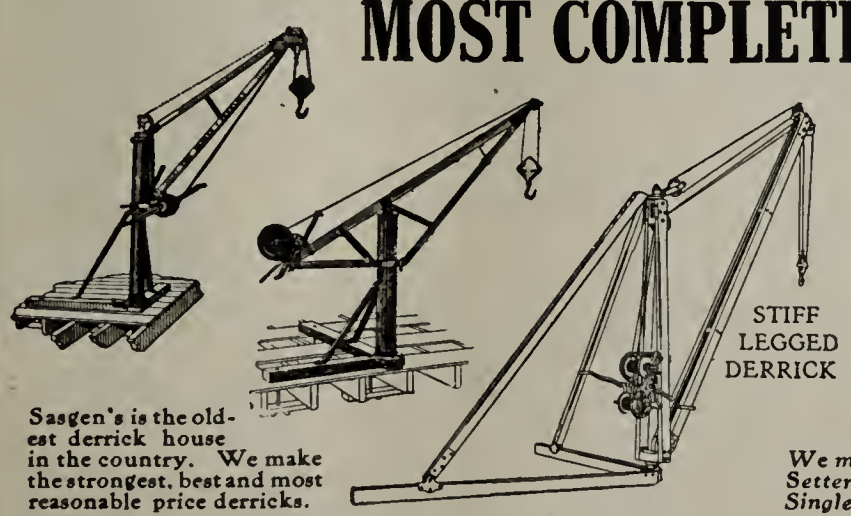


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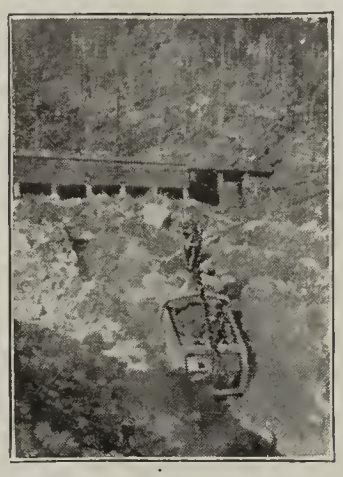

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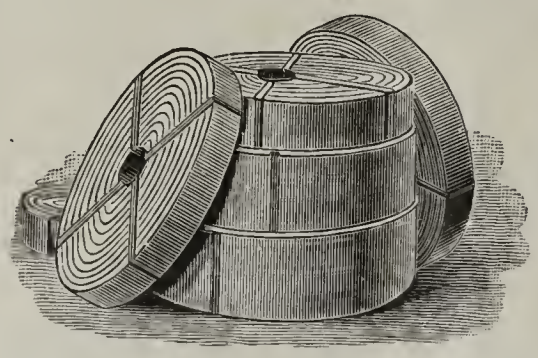

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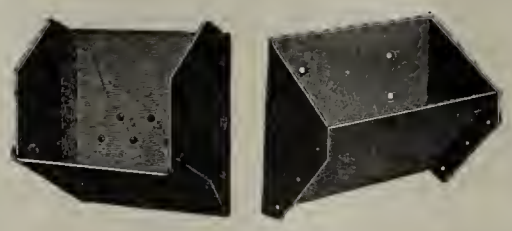

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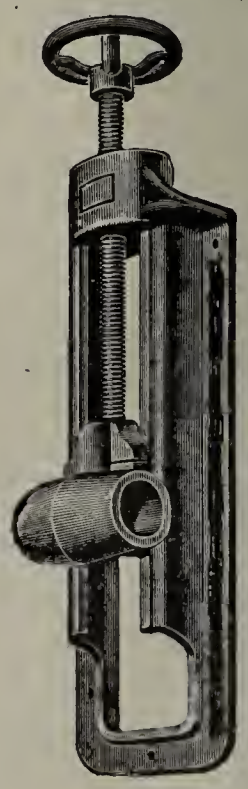

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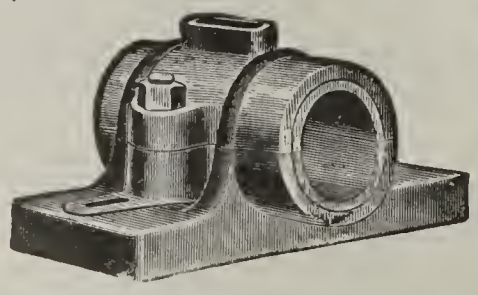

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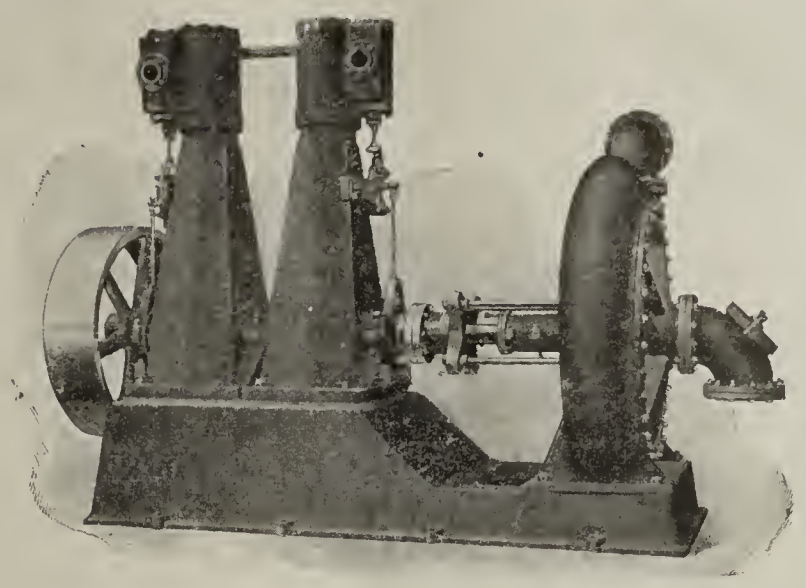

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Small sizes as well as largest ones are designed to give maximum output and greatest wear for a given weight.

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*Designing and Consulting Engineer*
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Eight Thousand Gallons of Percoproof were used for waterproofing the eighteen great buildings that constitute the Cincinnati General Hospital.

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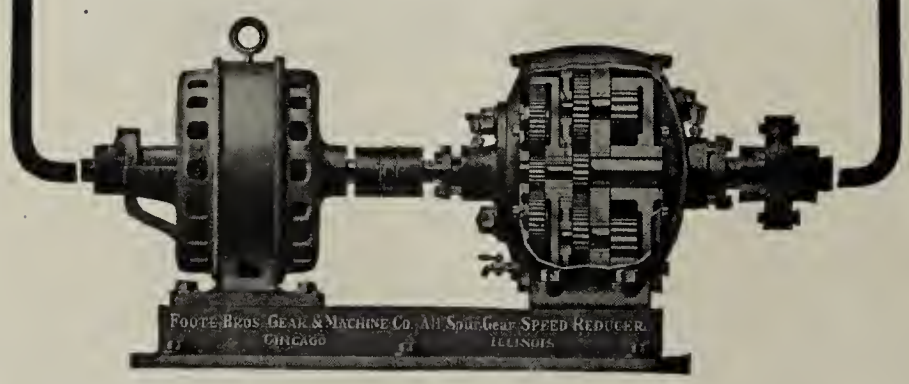
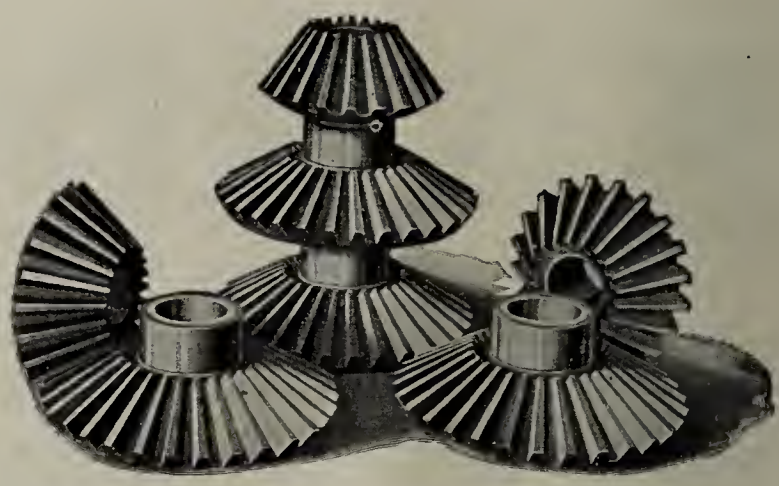
**Manufacturers of Cut Gears of all kinds**



## *Make Your Gear Service a Certainty*

**Ganschow Bevel Cut Gears—like Ganschow Gears of every kind—are cut with an accuracy and precision which makes smooth, easy, effective working a certainty. They minimize wear and tear and insure long life to the parts. From twenty to forty per cent less power is required to operate**

## *Ganschow Cut Gears*

**as compared with cast gears, because of evenly-thick and evenly-spaced teeth, and because they are uniformly smooth. Throughout the whole machine the jar and strain are greatly reduced; and this means gear-efficiency from every standpoint.**

As specialists in gear work, our splendid facilities enable us to take care of any requirement from the smallest gear up to 12 ft. in diameter—and do it QUICK. Every gear strictly according to specifications and free from defects.

**How about YOUR gear requirements?**

***Wm. Ganschow Company, Chicago, Ill.***

***1003 W. Washington Street***

# Plamondon

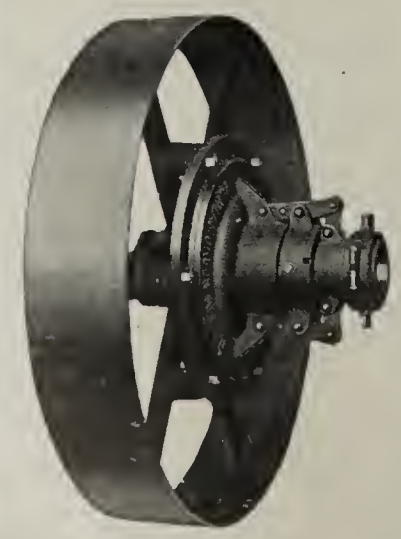
## Clutches

### Disc Type-Friction

The continuous friction surfaces consist of only three parts—all the simple mechanism for adjusting and operating is on the outside in plain view—the adjustment for wear is made entirely by means of one adjusting collar—absolutely without springs—dust and fool proof.

## Gears

The Plamondon line of gears is complete, and for 57 years has maintained the highest standard of quality. Plamondon gears must satisfy you. Spur Gears, Bevel Gears, Miter Gears, Spur Mortise Gears, Bevel Mortise Gears, Miter Mortise Gears.

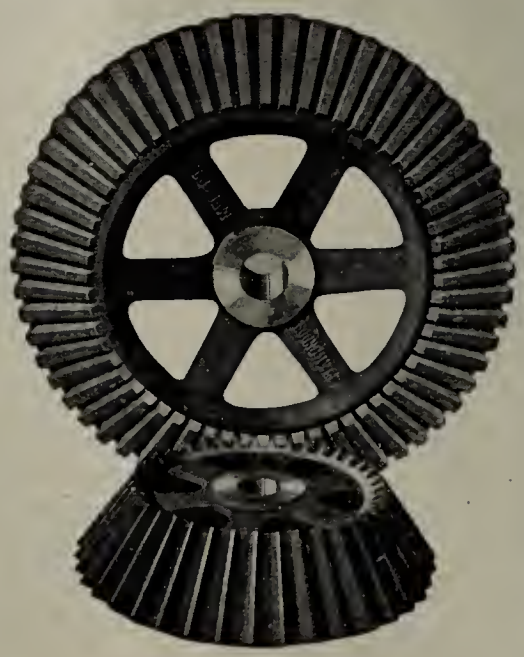


## Two Catalogs Valuable in the Cement Mill

**Clutches - No. 157**

**Gears - - No. 156**

Let us send you these two catalogs. Besides showing the Plamondon lines, they contain a lot of general information that may prove helpful to you.



## A. Plamondon Mfg. Co.

**12-24 N. Clinton St. Chicago, Ill.**

# BLACK GIANT STITCHED DOUBLE BELTING

THIRTY thousand feet of BLACK GIANT DOUBLE STITCHED BELTING in sizes ten to twenty-four inch eight ply furnished within the last sixty days to two of the largest cement plants in the United States. Both of these plants have used BLACK GIANT DOUBLE STITCHED BELTING for the past five years. BLACK GIANT DOUBLE STITCHED BELTING is the most improved cotton belting manufactured today and is adapted for all kinds of work wherever machinery is run, either for transmission of power, elevators or conveyors.

*Manufactured exclusively by*

**McIlroy Belting and Hose Co.**

**Hammond, Indiana, U. S. A.**

**BELTING**

"V-B" Balata
"AMPERE"
(Canvas Stitched)
"WHITE SEAL"

Write for Prices, Discounts and Samples

**VICTOR BALATA & TEXTILE BELTING CO.**

Factory: Easton, Pa. Main Office: 38 Murray St., New York
Stores: 167 N. Market St., Chicago, and 87 High St., Boston

**CONVEYOR BELTS A SPECIALTY**

MADE WITH OR WITHOUT REINFORCEMENT

TRADE MARK **-OBSTITCH-** Reg. U. S. Pat. Office

With Patented Diamond
**REINFORCEMENT**

**"THE BEST TEXTILE BELT IN THE WORLD"**

**For Cement Mills, Stone Crushers, Pulverizers, Brick, Gypsum, Fertilizer Plants, and General Transmission**

**MOUNT VERNON BELTING COMPANY**
LICENSEES
327-333 WARREN AVENUE, - - - BALTIMORE, MD.

# THE FULLER ENGINEERING COMPANY

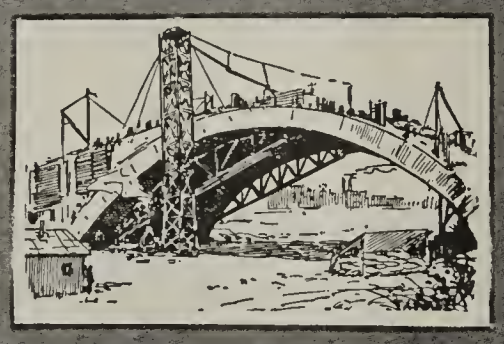
**Designing, Constructing and Operating Engineers**
**Cement and Hydrated Lime Plants a Specialty**

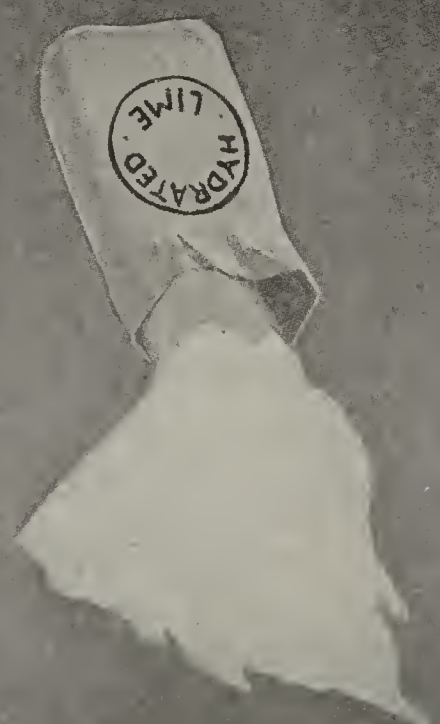
**Reports, Examinations and Analyses of Raw Materials for Cement Consultations Solicited**

**Offices: Allentown National Bank Bldg.**
ALLENTOWN, PA.

**WATER** SOFTENING OR FILTRATION
FOR BOILER FEED AND ALL INDUSTRIAL USES
WM B SCAIFE & SONS CO PITTSBURGH PA

# The story of HYDRATED LIME






## SHOOTING CONCRETE 4,000 FEET

Out at San Francisco the Twin Peaks Tunnel is being built by R. C. Storrie & Co. It passes through water bearing soil and City Engineer M. M. O'Shaughnessy specified Hydrated Lime in the concrete to make the structure waterproof, eight pounds of hydrate being used to one hundred pounds of cement; the concrete proportions being 1 cement, 2¼ sand and 5 crushed gravel, graded from ¼ to 1¼ inches.

R. C. Hackley, engineer for the contractor, writes:

"On this work the pneumatic concrete placing system is used and we have shot the concrete twenty-six hundred feet through eight-inch pipe and expect to extend this line to four thousand feet or more; the lime being a great help as a lubricant. Where chutes are used they can be much flatter and will carry the concrete much farther with lime in the mix; in fact we have used lime for this purpose and for easier placing in narrow walls and around reinforcement, even when not specified, on account of the labor saved.

"The uniformity of the concrete on this piece of work and the absence of honeycomb patches can be greatly attributed to the use of Hydrated Lime."

*Write any of the following competing manufacturers of Hydrated Lime for complete information about Hydrated Lime in Concrete.*

**Marblehead Lime Co.,**
Chicago—Kansas City

**Port Byron Lime Assn.,**
Port Byron, Ill.

**Solvay Process Co.,**
Moline, Kans.

**Tidewater Portland Cement Co.,**
Baltimore, Md.

**Lee Lime Co.,**
Lee, Mass.

**Glencoe Lime & Cement Co.**
St. Louis, Mo.

**Dutchess County Lime Co.,**
Dover Plains, N. Y.

**Palmer Lime & Cement Co.,**
103 Park Ave., New York, N. Y.

**Rockland & Rockport Lime Co.,**
New York—Rockland, Maine—Boston

**The A. & C. Lime Co.,**
Canton, Ohio.

**Kelley Island Lime & Transport Co.,** Cleveland, Ohio.

**National Lime & Stone Co.,**
Carey, Ohio.

**Ohio Hydrate & Supply Co.,**
Woodville, Ohio

**John D. Owens & Son Co.,**
Owens, Ohio.

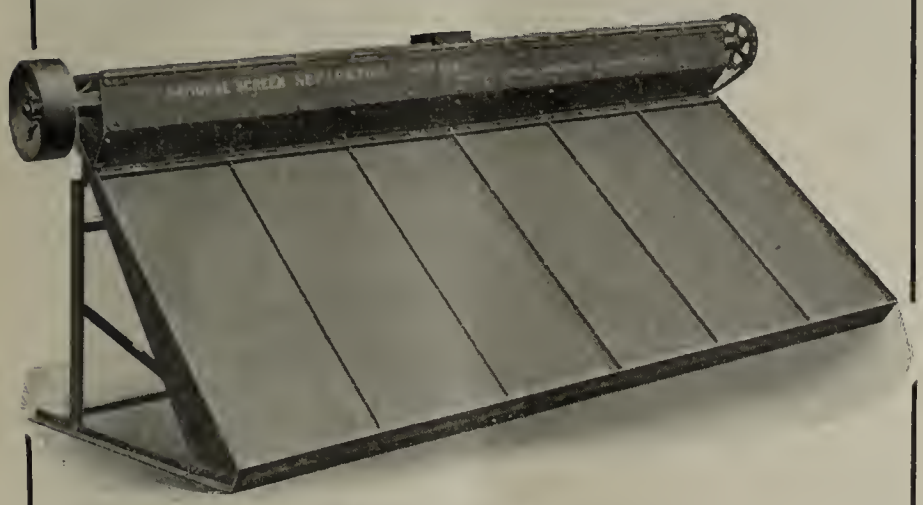
**Woodville Lime & Cement Co.,**
Toledo, Ohio

**Merion Lime & Stone Co.,**
Norristown, Pa.

**Vermont Marble Co.,**
Proctor, Vermont

**Riverton Lime Co.,**
Riverton, Va.

# National Screen Separator



No. 5. National Screen Separator 12 ft. wide.

## Gives Positive Results and Greatest Efficiency

**Built in four sizes, 4, 6, 8 and 12 ft. wide.**

*Other special features to consider are as follows:*

Simplest and most substantial construction.
Economical operation.
No mechanism on lid or cover.
Can Examine the separator while in operation.
Abundant references from the largest concerns.

*Write for catalog and prices*

**NATIONAL ENGINEERING CO.**
5 N. La Salle Street CHICAGO

# The Rugged Ruggles AERIAL CARRIER

**Suspended over Slate Quarry**

## SELF DUMP BRAK LOCK ING

**Built in Two Sizes:—1 to 5 tons capacity, 5 to 10 tons capacity.**

The **Rugged Ruggles** is made for special use on cement and gravel construction work. For all kinds of quarries where the waste is taken from the pit and dumped at the surface It will take any load up to **ten** tons, from any depth to the cable, where it is automatically released and sent either up or down the cable and dumped in mid-air or lowered. One man can operate three **Rugged Ruggles** on as many cables with a three-drum engine:

**No brake to wear the cable—Can run on a flat cable.**

Simple in construction; made entirely of steel; all the sheaves steel bushed or brass, and is backed by years of extensive use.

**Manufactured by**

**Ruggles Machine Co.,** POULTNEY VERMONT Dept. C

# Centrally Located

**Near All the Famous Shops and Theatres**

# HOTEL EMPIRE

**Broadway at 63rd Street**
**NEW YORK CITY**

Room, use of bath **$1.00** Room with bath **$1.50**
Parlor, bedroom and bath, one or two persons **$2.50**

Add to the above rates, 50c for each additional person.
All surface cars and Fifth Ave. Busses pass the door.
Subway and "L" stations—two minutes.
Beautiful Central Park—1 block.
OUR RESTAURANT is noted for its excellent food and moderate prices.

**P. V. LAND, - Manager**

# NORTHWESTERN PORTLAND CEMENT

**A RELIABLE PORTLAND CEMENT**

NORTHWESTERN STATES PORTLAND CEMENT CO. MASON CITY, IA. NORTH WESTERN PORTLAND CEMENT REGISTERED TRADE MARK

**A PORTLAND CEMENT FOR THE NORTHWEST**

**Northwestern States Portland Cement Co.**
**MASON CITY, IOWA**

## MACHINERY FOR SALE

Our entire machinery equipment consisting of two steam shovels (one Marion 3-yd. model 61, practically new, one Bucyrus 2½-yd.). Two Locomotives (62 and 50 tons). Ten side dump cars standard gauge. Four Fairbanks-Morse oil and gas engines (32, 32, 8 and 5 H. P.). Two Fairbanks-Morse Duplex Pumps (10½x12 and 5x6). Other pumps and engines, Electric Light Plant, Gravel Washing Plant, Piping and many other items. Everything in good condition. Plant now running, but will close down November 1st account car shortage. Morgan Sand & Gravel Co., Inc., c/o Ouachita Natl. Bank, Monroe, La.

## QUARRY SUPERINTENDENT WANTED

Quarry Superintendent capable of handling large stone quarry in eastern Pennsylvania. Must be experienced in the operation of boilers, hoisting engines, air compressors, drilling and blasting. Output to quarry must be doubled in the next six months. This is an excellent opportunity for an experienced man, who is a hustler. State fully, age, experience, references, married or single, date available, and salary expected. Address reply to W. W. W., care of CEMENT & ENGINEERING NEWS, 672 Transportation Bldg., Chicago, Ill.

## AIR SEPARATORS WANTED

Wanted to buy second-hand air separators similar to Osborn, Raymond or Stroud make. Address M. N., care of CEMENT & ENGINEERING NEWS, Transportation Bldg., Chicago, Ill.

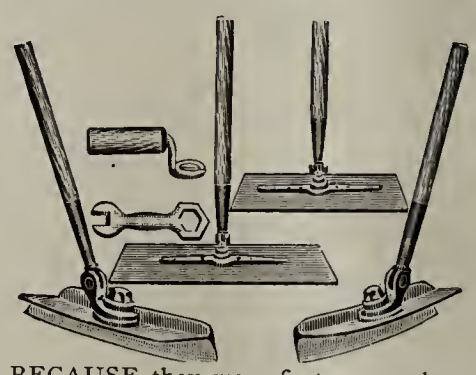
# Crushing Plant

## PRACTICALLY NEW— IMMEDIATE DELIVERY

2—No. 6 McCully **Gyratory Crushers**
1—No. 5 McCully **Gyratory Crusher**
1—4 ft. x 8 ft. Grizzly, 2 in. **Spacing**
1—**Belt Conveyor,** complete with all fixtures
1—Patnoe **Steel Chain Elevator,** 35 ft. centers
1—No. 8 **Geared Head Elevator,** 69 ft. center.
1—40 in. x. 15 ft. **Pipe Bar Screen**
1—Leyner-Ingersoll **Drill Sharpener**
1—Leyner-Ingersoll **Drill Sharpener** complete with dies, dollies, gauge, etc.
1—7 x 10 Leonard Ball Automatic Stationary Engine
1—16 x 18 Erie Stationary Engine
1—Horizontal Tubular **Economic Boiler,** 125 H.P.
1—General Electric Company **Generator,** 9½ Kw.
4—Canadian-Ingersoll-Rand **Steam Drills** style No. 54, complete with weights and tripods.
1—BCR **Jackhammer**
1—No. 2 Rotary **Class CN Drill,** Chicago Pneumatic Tool Company

**Oscar Daniels Company**

**First National Bank Bldg.** **Chicago, Ill.**



## There Are Reasons Why YOU Should Use ARROWSMITH Tools

BECAUSE they were first on market and have stood the test.
BECAUSE they are adjustable to any angle or height.
BECAUSE you can do your work quicker, easier and better.
BECAUSE one man can do work of five with short handled tools.
BECAUSE they save you time, labor and money.
BECAUSE you can try them 10 days against any others on the market; if you don't like ours better, send them back.

*Write for catalog or set on trial.*

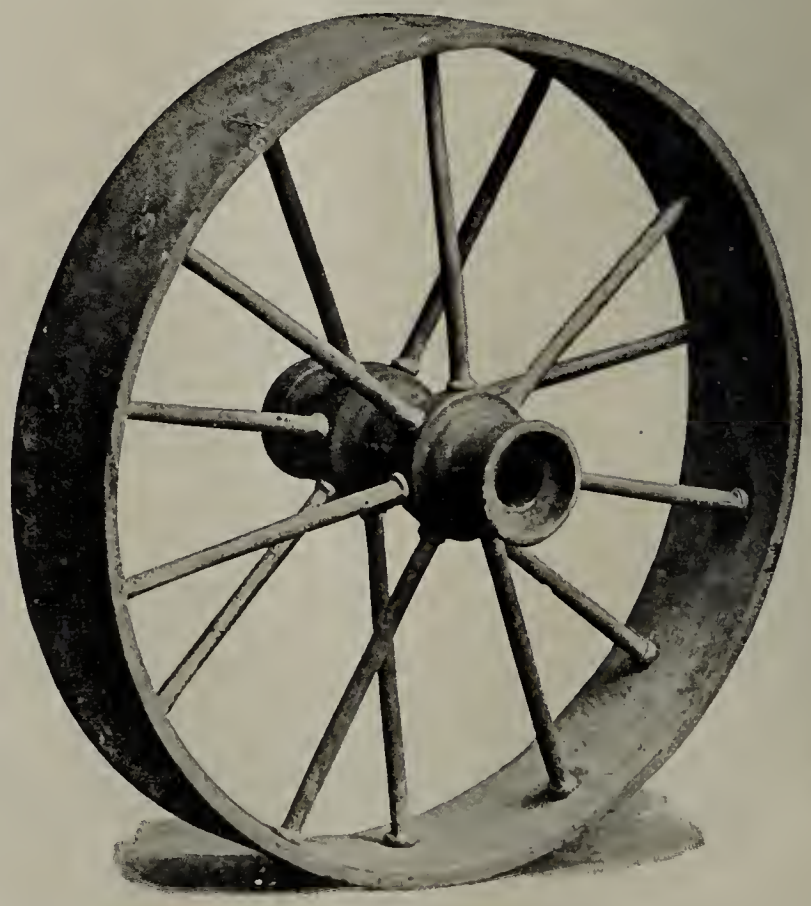
**Arrowsmith Concrete Tool Co. (Bank Bldg.), Arrowsmith, Ill.**

# FRENCH & HECHT

**Davenport, Iowa** **Springfield, Ohio**

**Metal Wheels in quantity for Manufacturers only**

***Combined capacity 8,000 tons per month***



## Henry Heil Chemical Company

**210 to 214 South Fourth Street, ST. LOUIS, MO.**

We make a specialty of supplying cement works with

**Chemical Apparatus, Chemicals and Reagents**

Gilmore's Needles, Cement Moulds, Vicat Apparatus, Schumann's, LeChatelier's and Jackson's Specific Gravity Apparatus, Etc.

**Pyrometers, Calorimeters**

**High Grade Goods Only**

*Satisfaction Guaranteed*

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Advertisements in this column are inserted at the rate of two dollars per inch per issue—and no advertisement will be taken for less than two dollars and must be paid strictly in advance.

### POSITION WANTED BY CHEMIST

First-class all-around cement chemist open for engagement; will accept nothing but first-class position; familiar with Spanish. Address C. B. W., care Cement & Engineering News, 672 Transportation Bldg., Chicago, Ill.

### FOR SALE

Best quality reinforcements for Posts, Silos, etc. Sharon Concrete Post Co., Van Buren, Indiana.

### POSITION WANTED—CRUSHING PLANT.

Position wanted by young man with 12 years' experience in contracting, and crushing stone, 8 years as superintendent of large plants. Capable of managing any, or all departments. Bank references of capability and character. Interested only in commission and salary contract. Open January 1, 1918. Address Box 531, c/o Cement & Engineering News, 672 Transportation Bldg., Chicago, Ill.

### WANTED KILN.

Wanted: One second-hand kiln or cooler approximately 6'x60'. State price, condition and location. F. L. Smidth & Co., 50 Church St., New York City.

### POSITION WANTED—SUPT. OR CHEMIST.

Chemical Engineer and Cement Expert. Fifteen years' experience in cement manufacture as Head Chemist and Supt. desires position with a Portland Cement Co. as Superintendent, Assistant Superintendent or Head Chemist. Address Cement, 112 Locust St., Barberton, Ohio.

## FOR SALE OR RENT

**Immediate Delivery**

## Dump Cars, Locomotives, Shovels, Etc.

90—12-yd. Western air dump cars.
3—4-wheel switching locomotives, separate tenders.
2—6-wheel switching locomotives, separate tenders.
2—70C Bucyrus Shovels. Shop Nos. 1351 and 1410.
2—Western standard gauge spreader cars.
35—1½-yd, 24-in. gauge Western side-dump cars.
4—box cars and 2 flat cars.
Miscellaneous extras, repair parts, etc., for above equipment.
Also considerable other equipment for contractors, quarries and gravel pits, such as clam shell buckets, drag lines, crushers, drills, locomotive cranes, pumps, boilers, wire rope, hoisting engines, compressors, rails, etc.
What are your requirements? Please telegraph, telephone or write us.

**CLAPP, NORSTROM & RILEY, 12-14 So. Canal St., CHICAGO, ILL.**

## WANTED

**Locomotive Cranes**

**Hoisting Engines**

**Standard Gauge Saddle Tank Locomotives**

**F. MAYER**

**1601 Monadnock Bldg.**
**CHICAGO, ILL.**

## Second Hand Equipment—For Sale

### MARSH'S GUARANTEED LIST

#### Buckets
1—2 -yd. Hayward
4—1½-yd. clam-shells, various makes
1—1 -yd orange-peel bucket
1—1 -yd. Page Dragline bucket
1—2 -yd. Page Dragline bucket
1— ¾-yd. Slack-line outfit complete

#### Cars
20— 4 -yd. Western 36-in. gauge cars
20— 1½-yd. Western 24-in. gauge cars
30—12 -yd. Western standard-gauge cars
30— 2½-yd. quarry cars, steel bodies
20—60,000 capacity gondolas

#### Compressors
1—Ingersoll-Rand Imperial type X-B-2, capacity 2400 ft., belt-driven
2—Bury Duplex, cap. 500 ft. each
1—Ingersoll-Rand Imperial Type, 2 stage belted, 250 ft. per minute. New.
1—14 x 12 Laidlaw-Dunn-Gordon belted
1—Sullivan 2-stage steam-driven, cap. 1800 ft.
Lots of others.

#### Locomotives
2—10 x 16—36-in. gauge dinkies
2— 9 x 14—36-in. gauge, just overhauled
2— 7 x 12—24-in. gauge
1—150-ton Shay, geared, almost new
1—20 x 28 Mogul, good as new
1—90-ton Mikado type, new
2—60-ton 10-wheelers, 170-lb. pressure

#### Crushers
1—No. 5 McCully
1—No. 6 Gates, style K, complete plant
1—No. 7½ Austin, complete plant
1—No. 8 McCully
1—No. 9 Gates K, good as new
1—No. 30 Kennedy
1—20 x 24 Traylor Jaw Crusher
1—Shaft for No. 7½ Gates

#### Road Builders Outfit
10,000 ft. Koppel 24-in. ga. portable track
30 Koppel V-shape 24-in. ga. cars

#### Drag-Lines
1—Page drag-line, 50-ft. boom, 1-yd.
1—White Traction, 40-ft. boom, 1-yd.
1—Class 14 Bucyrus
1—Slack-line outfit complete, 1-yd.

#### Hoisting Engines
2—7 x 10 D.C., D.D., hoists, American
1—9 x 10 3-drum, with swinging gear and boiler
2—10 x 12 D.C., D.D. American, with boilers
1—6¼ x 8 Builders' Hoist, reversible
1—Flory cableway, complete, 1000-ft. span
1—American Swinging Engine

#### Cranes
1—15-ton 4-wheel American, single line
1—15-20-ton Brownhoist, 8-wheeled M.C.B., almost as good as new
1—15-ton Browning, 4-wheeled
1—O & S, 12-ft. gauge, all steel, good as new
2—McMyler 14-ft. gauge, all steel, fine

#### Steam Shovels
1—No. 1 Thew traction shovel, 1-yd.
1—No. 0 Thew shovel, first-class
1—18B Bucyrus Traction
1—Model "41" Marion st. gg. trucks
1—Model "60" Marion 2½-yd. dipper
1—Model "61" Marion, extra high boom
1—70-ton Bucyrus, first-class
1—Model "50" Marion, almost new

#### Rollers
1—10-ton, 3-wheeled
1—10-ton Austin gasoline
1— 8-ton tandem

#### Rail
3,000 tons, from 30 to 60 lb.

#### Miscellaneous
1—Keystone Excavator, new last winter
1—10 x 6 x 10 Duplex steam
1—10 Morris Sand Pump
1—No. 2 Vulcan steam hammer
20—Steam drills, various sizes and makes
2—Steam Tugs
4—Dump scows
4—Tanks, various sizes
1—Holt 40-60 Caterpillar tractor
1—Huber Steam Tractor
1—Western Elevating Grader, good as new
1—Derrick car, 9 x 12, 3-drum engine, with claw shell, good condition

***If you don't see it here, write anyhow and we will get it for you.***

**MACHINERY WAREHOUSE & SALES COMPANY,** *Successors to* **GEO. C. MARSH & CO.**

**Tel. Harrison 5799** **750 Old Colony Building, CHICAGO**

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### Chimneys
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### Cranes, Locomotive
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### Pipe for Potash Plants
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Austin Mfg. Co.
The Jeffrey Mfg. Co.
Traylor Eng. & Mfg. Co.
Universal Crusher Co.
Western Wheeled Scraper Co.
Worthington Pump & Mchy. Co.

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John H. Irey.
Monarch Mfg. Co.
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W. E. Dunn Mfg. Co.
Ideal Concrete Machinery Co.
Jaeger Machine Co.
Municipal Eng. & Construction Co.
Northwestern Steel & Iron Co.
Republic Iron Works.

### Engineers
Fuller Engineering Co.
Hunt Engineering Co.
The Jeffrey Mfg. Co.
Daniel B. Luten.
Richard K. Meade.
F. L. Smidth & Co.
Soper Engineering Co.
Preston K. Yates.

### Excavators (Drag Line Cableway)
Sauerman Bros.

### Fuses—Blasting
Ensign-Bickford Co.

### Gears
Foote Bros. Gear & Machine Co.
Ganschow Co., Wm.
A. Plamondon Mfg. Co.
Stroh Steel Hardening Process Co.

### Loaders and Unloaders
Geo. Haiss Mfg. Co.
Jeffrey Mfg. Co.
Link-Belt Co.

### Locomtives (Electric)
Jeffrey Mfg. Co.

### Locomotives (Gasoline)
J. D. Fate Co.

### Motors (Electric)
Westinghouse Electric & Mfg. Co.

### Motor Trucks
Standard Motor Truck Co.

### Power Transmitting Machinery
H. W. Caldwell & Son Co.
B. F. Gump Co.
Jeffrey Mfg. Co.
Link-Belt Co.

### Powder
Du Pont Powder Co.

### Screens
Allis-Chalmers Mfg. Co.
Austin Mfg. Co.
Excavating & Screening Machy. Co.
National Engineering Co.
Sturtevant Mill Co.
Traylor Engr. & Mfg. Co.

### Wire Rope
Fischer & Hayes Rope Co.
Sauerman Bros.

### Chemical Apparatus
Henry Heil Chemical Co.

### Clutches
A. Plamondon Mfg. Co.
Porter Machine Co.

### Cement Mill Machinery
Allis-Chalmers Mfg. Co.
Bonnot Co.
Bradley Pulverizer Co.
Clark Dust Collector Co.
The Jeffrey Mfg. Co.
Lehigh Car Wheel & Axle Works.
F. L. Smidth & Co.
Sturtevant Mill Co.
Traylor Eng. & Mfg. Co.
Williams Pat. Crusher & Pulv. Co.
Worthington Pump & Machy. Corp.

### Aerial Carrier
Ruggles Machine Co.

### Dump Cars
Western Wheeled Scraper Co.

### Derricks
Sasgen Derrick Co.

### Ornamental Molds
W. E. Dunn Mfg. Co.
Ideal Concrete Machinery Co.
Northwestern Steel & Iron Works.

### Reinforcing Bars
Concrete Steel Co.
Franklin Steel Works.
Witherow Steel Co.

### Sands and Aggregates
Badger Crushed Granite Co.
Conlin & Co.
Middlebury Marble Co.

### Sidewalk Forms
Automatic Sealing Vault Co.

### Silo Forms (Monolithic)
Polk-Genung-Polk Co.

### Silo Molds (Stave)
Co-operative Concrete Constr. Co.

### Sand Lime Brick Machinery
American Clay Machinery Co.

### Speed Reducer Transmission
Foote Bros. Gear & Machine Co.
Wm. Ganschow Co.
Reeves Pulley Co.

### Pulverizers
Aero Pulverizer Co.
Allis-Chalmers Mfg. Co.
Bonnot Co.
Bradley Pulverizer Co.
Jeffrey Mfg. Co.
Lehigh Car Wheel & Axle Works.
Sturtevant Mill Co.
Williams Pat. Crusher & Pulv. Co.

### Kilns
Allis-Chalmers Mfg. Co.
Traylor Eng. & Mfg. Co.
Worthington Pump & Mchy. Corp.

### Bar Benders
Waterloo Construction Co.

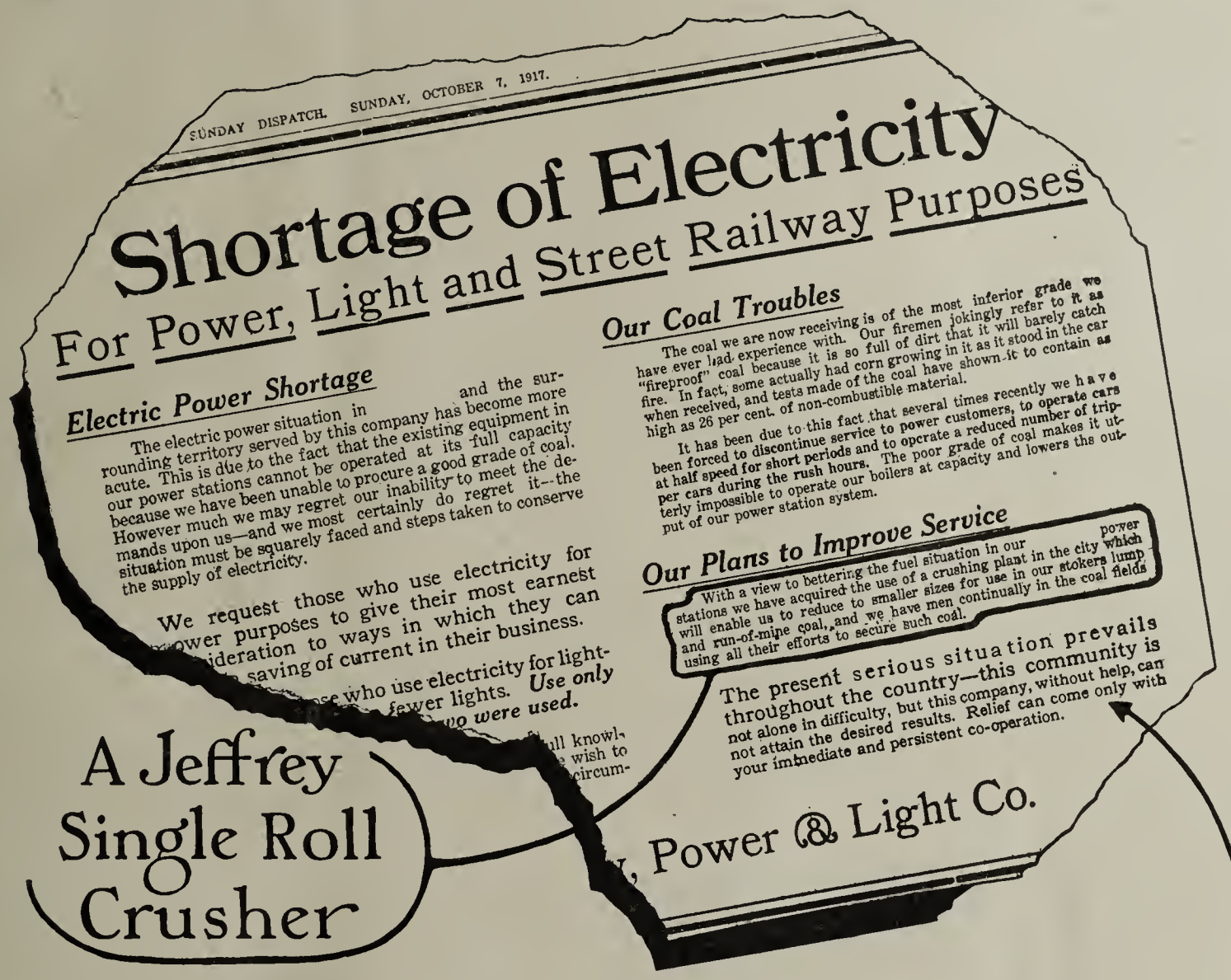
### Burial Vault Molds
Automatic Sealing Vault Co.

### Cement Finishing Tools
Abram Cement Tool Co.
Arrowsmith Concrete Tool Co.
Ideal Concrete Machinery Co.

### Water Softener
Wm. B. Scaife & Sons Co.

### Metal Wheels
French & Hecht.

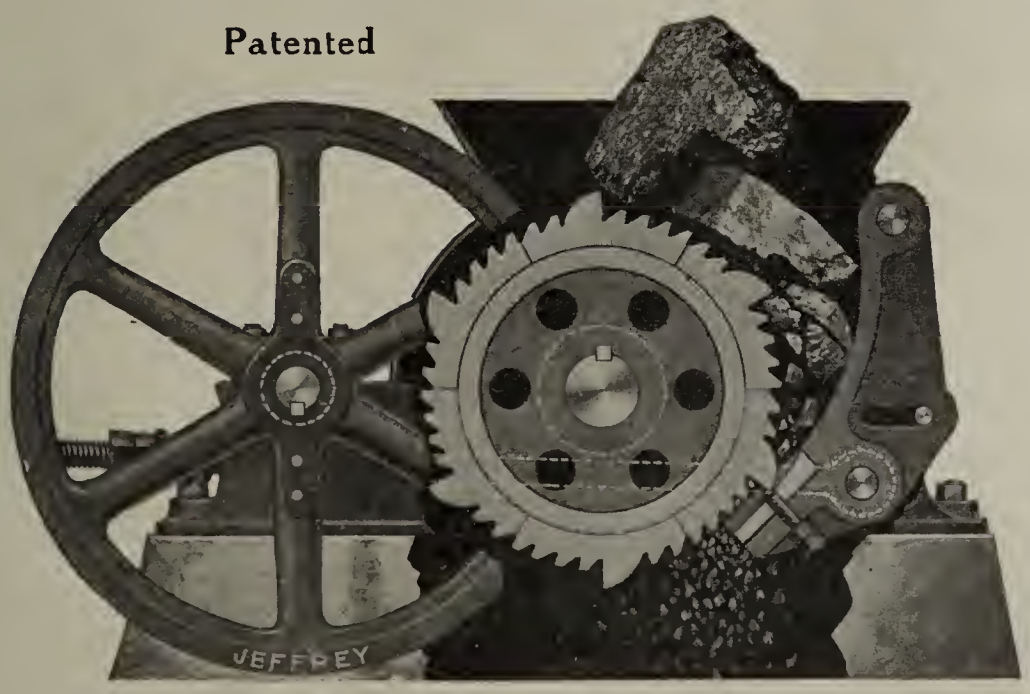
### Roofing Tile Machinery
Walter Concrete Machinery Co.




# Are YOU Facing a Similar Situation?

IF so, why not Crush your Run-of-Mine or Lump Coal right in your own plant with a

Patented




# JEFFREY
## SINGLE ROLL
# Coal Crusher

Reduces Run-of-Mine or Lump Coal for Stokers — for Feed to Dryers or to Finishing Mills

*Bulletin No. 141-D fully describes this machine—tells what it has done for others*
*Send today for your copy*

# The Jeffrey Manufacturing Company

914 North Fourth Street, Columbus, Ohio

# The Recovery of Potash

## is an economical and profitable process In Many Cement Mills

It has been estimated that one third of the country's requirements for Potash could be obtained from the cement industry alone, by the Electrical Process of Dust Precipitation.—A complete line of—

**Westinghouse Electrical Equipment**

has been developed, specially designed for the Cottrell Process, and is in successfull operation in many plants throughout the country.

**Westinghouse Electric & Manufacturing Co.**
**East Pittsburgh, Pa.**

# Westinghouse

Service is no side-issue with ATLAS. Personal service to every man who has blasting to do is the bone and sinew of our success.

Our business is making explosives. Naturally we want to *sell more* explosives and make more money. We are achieving this result by giving to each individual customer an explosive that will produce the best results at the least cost.

ATLAS service makes your blasting more efficient, more economical. It cuts the cost by making your explosives do more and better work for less money.

More than a century of experience in the manufacture of explosives is at your command.

Whatever your blasting problems may be, our entire organization will work shoulder to shoulder with you to solve them.

# ATLAS POWDER COMPANY

**Home Office: Wilmington, Del.**

Sales Offices: Allentown, (Pa.), Birmingham, (Ala.), Boston, Chicago, Des Moines, Houghton, (Mich.), Joplin, (Mo.), Kansas City, Knoxville, McAlester, (Okla.), Nashville, New Orleans, New York, Philadelphia, Pittsburg (Kan.), Pittsburgh (Pa.), Pottsville (Pa.), St. Louis, Wilkes-Barre (Pa.).

**A PROPER EXPLOSIVE FOR EVERY BLASTING REQUIREMENT**

**Put your blasting problems up to us**

Our Service Department is a clearing house of blasting experience in all its phases and under all conditions. It is directed by experts who will personally help you apply this vast store of information to your own *blasting*. WRITE TODAY.

*Largest Manufacturers of Commercial Motor Vehicles in America*

One of the nine White Trucks owned by The Cleveland Builders Supply Company

# WHITE TRUCKS
## Cut Hauling Cost

THE successful truck for use in hauling contractors' supplies and building material must be highly efficient, durable, dependable, easily operated and economical in operation and maintenance. White trucks meet these requirements from every standpoint.

Many builders supply companies have found the White 5-ton Dumping Truck to be the most efficient solution of their delivery problems. This truck may be loaded from a clam shell or hopper in a very short time and with much less waste than would be the case with a narrower body. The White Power Dumping mechanism, obtainable only on White Trucks, will dump a complete load in thirty seconds.

The performance of White Trucks in this country is so wel known and their distribution so widespread that they have gained predominance in practically every line of business where transportation is involved.

H

## THE WHITE OMPANY
CLEVELAND

*Awarded the ONLY GRAND PRIZE for Motor Tr ucks at the Panama-Pacific International Exposition, San Francisco*

# A. Hettrick Conveyor Belt

**Making Wonderful Endurance Records at This Plant**

"Has given us better satisfaction than any other belt we ever used," writes J. L. Thomas, Superintendent, Tioga Gravel Co., Alexandria, La., whose plant is illustrated above.

The success of Hettrick Red Stitched Canvas Conveyor Belting is a plain case of "survival of the fittest." When mills similar to yours come back repeatedly with orders covering their conveyor belt requirements—what stronger evidence of merit can you ask?

The rains of spring, the heat of summer, the droughts of autumn the cold of winter, may do their utmost, but Hettrick continues on the even tenor of its way, doing its work faithfully and well, be it outdoors or indoors.

As a piece of workmanship it is the perfection of cotton weaving. As a transmitter of power it is unsurpassed. As a conveyor it is unequalled.

We would like to send cement and lime manufacturers and gravel, sand and crushed stone producers a sample and folder that tells the whole story of Hettrick Conveyor Belting.

## The Hettrick Mfg. Co.

TOLEDO, OHIO

# "JUST TO MY LIKING"

**Writes W. O. SMITH**

**Secretary and General Manager Detroit-Oxford Gravel and Stone Co.. Oxford, Mich., regarding the 24 inch Symons Disc Crusher which they have had in operation in their plant for the past six years.**

"This crusher is just to my liking, we find it quite satisfactory for crushing hard rock and gravel. It works in connection with our gyratory for recrushing and it turns out a uniform product. The power required for operating this crusher is low."

**Equip Your Gravel and Crushed Stone Plant with a**

# Symons Disc Crusher

It will increase your output, lower your costs and deliver a more uniform material.

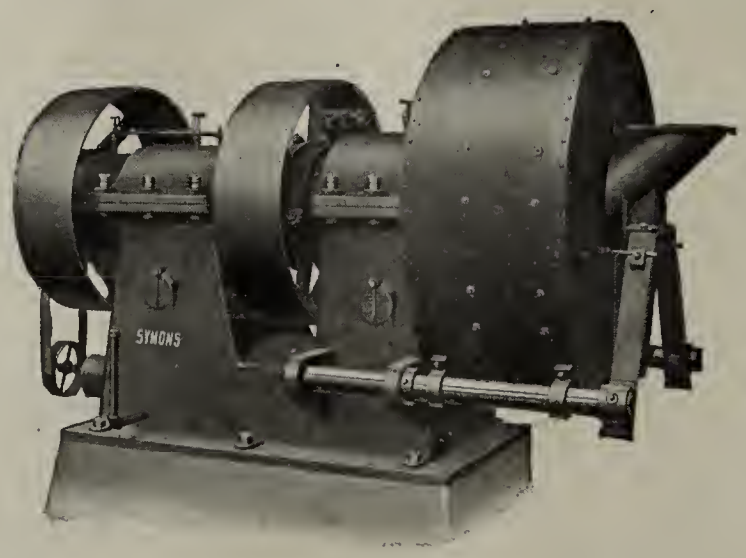
Built in four sizes: 18 in., 24 in., 36 in., and 48 in. Capacities from 5 to 120 tons per hour

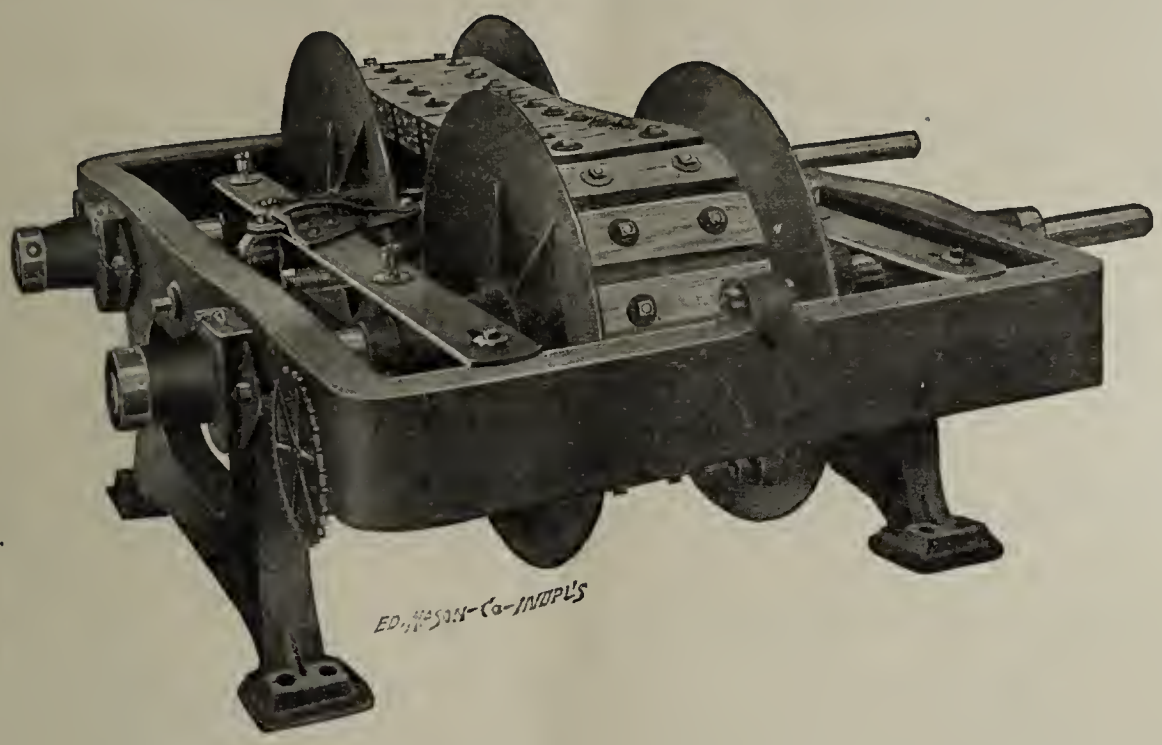
**PROMPT SHIPMENT DURING 1918**

**Manufactured and Sold only by**

## Chalmers & Williams

**Chicago Heights, Ill.**





"The Reeves"

# Variable Speed Transmission

## THE ONLY SOLUTION OF YOUR SPEED CHANGING PROBLEMS

It's a pretty stiff speed problem you're up against when you try to change the speed of your cement kiln or coal feeder. Especially so when you want a range of from 2 to 1 up to 10 to 1.

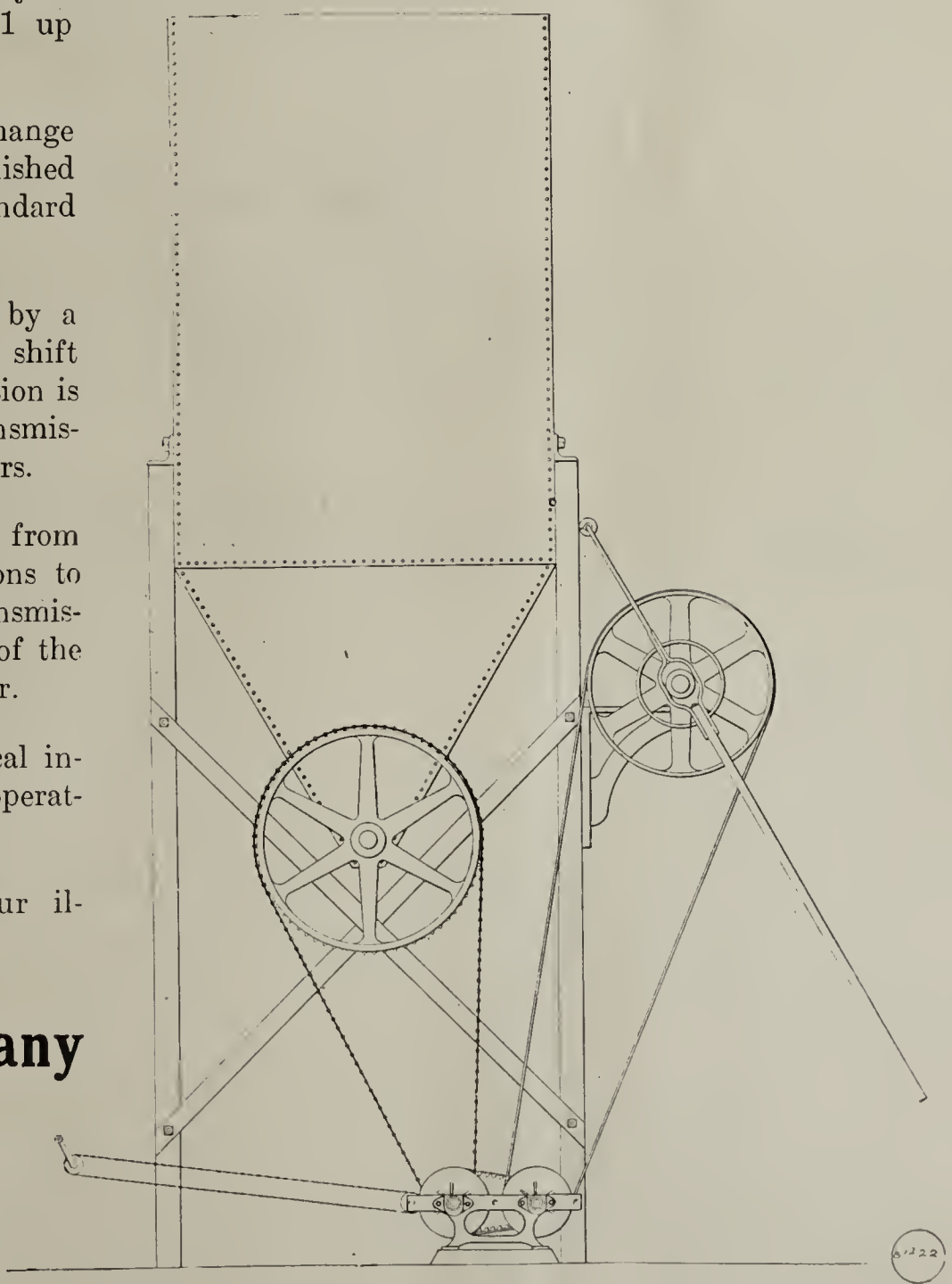
However, do you know that this speed change is not only possible, but is easily accomplished with "The Reeves" Transmission—the standard speed changing device.

The Transmission is operated simply by a hand wheel; there are no belts or gears to shift or tamper with. This simplicity of operation is one of the features which make the Transmission very popular with cement mill owners.

Just recently we received a large order from Japan for several large size Transmissions to operate a 9′ x 200′ rotary kiln. The Transmissions will be used to regulate the speeds of the kiln, coal injector and raw material feeder.

The illustration opposite shows a typical installation of "The Reeves" Transmission operating a coal feeder.

For further particulars write for our illustrated catalog, T-16.



## Reeves Pulley Company

### Columbus, Indiana

Chicago Branch:
Cor. Clinton and Monroe Sts.

# 3000 Men Are Needed Now

**You are asked to volunteer in the Road Building and Bridge Building Battalions of the 20th Engineers.**

## Men Who Know How to Build Roads and Bridges

**Men who have worked on drainage and ditching jobs will be needed. Wet cuts are the rule in France today. Construction men who have handled heavy equipment on boggy ground, will find their skill and knowledge in demand.**

**Motor truck operators are needed in every unit of the new Battalions. The list of skilled workers grows larger as America's Construction Men tackle the job of War and find who is needed at the Front. Follow the list through on next page and see if you can help by your brain and brawn our boys who are fighting in France.**

## Rates of Pay

**will be regular Army pay, which is clear money, for the army furnishes all food and clothing free. Your Army pay can all be saved. Good men will be chosen at once to act as non-commissioned officers. And there's plenty of room at the top.**

**There will be three battalions of four companies each. Each company contains 250 men. Read the Rates of Pay and the number of SKILLED CONSTRUCTION MEN needed in each company.**

**Remember the best men get the highest paid places.**

**See the following page for details.**

---

***You will not be held in this country until thoroughly drilled***
***By special permission men of draft age can enlist***

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Space donated by

| | |
|---|---|
| The Williams Pat. Crusher & Pulverizer Co. | ½ page |
| Franklin Steel Works | ¼ page |
| The J. D. Fate Company | ¼ page |
| Sturtevant Mill Co | ¼ page |
| B. F. Gump Co | ½ page |
| Lehigh Car Wheel & Axle Works | ½ page |

# Road and Bridgemen Over the Top

Again our boys on the other side are calling to join the Army of Liberty in France. More Road and Bridge Builders are needed to keep the lines of communication open. They are needed NOW! There will be no delays. As soon as they are assembled and equipped these construction men will be sent to France to work at their regular occupations — building and repairing roads, operating crusher plants, running motor trucks, road rollers, and tractors — building bridges and culverts. Any able-bodied white man between the ages of 18 and 40, who can meet the requirements, is eligible.

This is a War of Skilled Workers. The man behind the Piledriver, the Bridge Crew and the Road Gang will smash German autocracy just as truly as the men in the trenches. You are asked to volunteer in the Road and Bridge Building Battalions which will work with the 20th Engineers. If you are a ROAD BUILDER you are wanted over there. These men are needed:

## 3000 MEN ARE NEEDED NOW

| | | | |
|---|---|---|---|
| Grading Bosses | Road Grader Operators | Piledriver Foremen | Laborers |
| Steam Shovel Runners | Road Roller Operators | Bridgemen | Concrete Bridge Men |
| Firemen and Cranemen | Tractor Operators | Structural Ironworkers | Mixer Operators |
| Pitmen and Laborers | Wheeler and Fresno Skinners | Timbermen | Form Carpenters |
| Locomotive Crane Operators | Dump Bosses | Bridge Carpenters | Crusher Operators |
| | Motor Truck Drivers | Hoist Runners | Steam and Gasoline Engine Operators |
| | | Firemen | |

These and every other worker in the bridgebuilding and roadbuilding fields are wanted **now** on the other side.

## MEN OF DRAFT AGE CAN ENLIST

Men of Draft Age are permitted to enlist in these special battalions, providing that they can meet the full qualifications. Nobody but skilled workers are wanted. Practical men in every line will test your knowledge and skill regarding road-building or bridge-building work before you will be accepted for service in these special Battalions. These are no "white-collar" jobs. There are a few good clerks and material yard men needed, of course, but the BIG NEED is for red-blooded men who can DO THE WORK—without having to be told HOW.

## GRADE AND RATES OF PAY FOR ENLISTED MEN

| BATTALION | No. | Pay of each when abroad | BATTALION | No. | Pay of each when abroad |
|---|---|---|---|---|---|
| Master Engineer, Senior Grade | 2 | $96.00 | First Sergeant | 1 | $60.00 |
| Master Engineer, Junior Grade | 4 | 84.00 | Sergeant, First Class | 4 | 60.00 |
| Battalion Sergeant Major | 1 | 60.00 | Supply Sergeant | 1 | 51.20 |
| Battalion Supply Sergeant | 1 | 60.00 | Mess Sergeant | 1 | 51.20 |
| Sergeant | 2 | 51.20 | Stable Sergeant | 10 | 51.20 |
| Corporal | 2 | 40.80 | Sergeant | 10 | 51.20 |
| Wagoner | 2 | 40.20 | Corporal | 20 | 40.80 |
| Cooks | 1 | 44.00 | Horseshoer | 1 | 44.00 |
| Privates, First Class | 3 | 36.60 | Saddler | 1 | 40.20 |
| Privates | 6 | 33.00 | Wagoner | 5 | 40.20 |
| | | | Cook | 5 | 40.00 |
| | | | Bugler | 2 | 33.00 |
| | | | Privates, First Class | 66 | 36.60 |
| | | | Privates | 32 | 33.00 |

Total enlisted in one company 250.

## WIRE, WRITE OR MAIL THE COUPON

**Address MAJOR H. L. BOWLBY, Office of the Chief of Engineers, Room 25, War Department, Washington, D. C.**

I want to enlist in the Special Road and Bridge Battalions which will work with the 20th Engineers:

(1) Name ..... (2) Address .....

..... (3) Age..... (4) Nationality .....

(5) Married or Single..... (6) Have you been called in the draft?.....

(7) Will you enlist for period of the war?.....

(8) State briefly your working experience.....

.....

(9) What machinery can you operate?.....

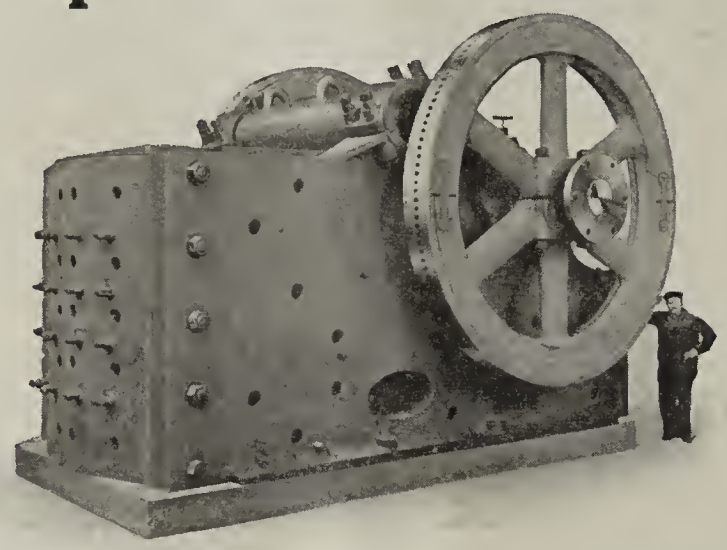
(10) Your present or a former employer must certify to your qualifications by signing here.....

.....

SIGNATURE OF EMPLOYER EMPLOYERS' ADDRESS FOR TELEGRAMS

**You will not be held in this country until thoroughly drilled** **By special permission men of draft age can enlist**

# Superior Jaw Crushers



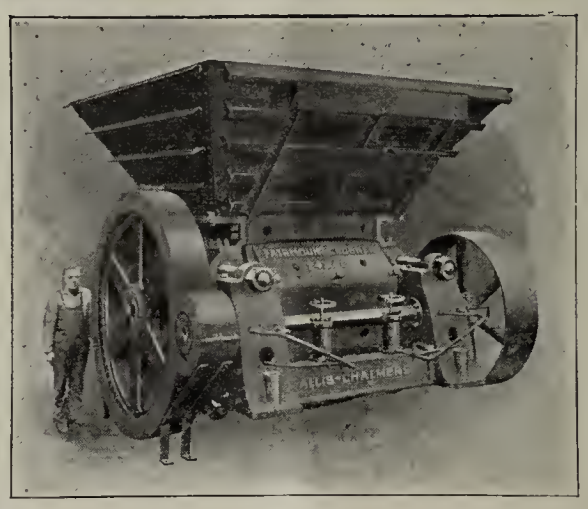
PARTICULARLY ADAPTED FOR CEMENT PLANTS: For use in connection with steam shovels of largest size. Size of Feed Openings: 36″x24″, 42″x40″, 60″x48″, 84″x60″. The advantages are: Large Feed Openings, Low Initial Cost, Low Cost of Maintenance, Low Power Consumption, Saving in Dynamite Saving in Labor, over hand loading, and above all **absolutely reliable.** One of our 84″x60″ Superior Jaw Crushers crushing hard trap rock has been in operation for nearly five years without the replacement of a **single part.** Described in our Bulletin No. 44-108.

## Worthington Pump & Machinery Corporation

**115 Broadway, New York**
**Power and Mining Works, Cudahy, Wis.**
**Chicago: 820 Old Colony Bldg.**



# FAIRMOUNT CRUSHERS



**For Reducing, Limestone. Dolomite, Magnesite, Phosphate Shale, or Materials of Similar Hardness**

## *Forcible Mechanical Discharge*

**Makes Fairmount Crushers Suitable For Sticky and Wet Materials**

## Allis-Chalmers Manufacturing Company

**MILWAUKEE, WISCONSIN**
**Offices in All Principal Cities**

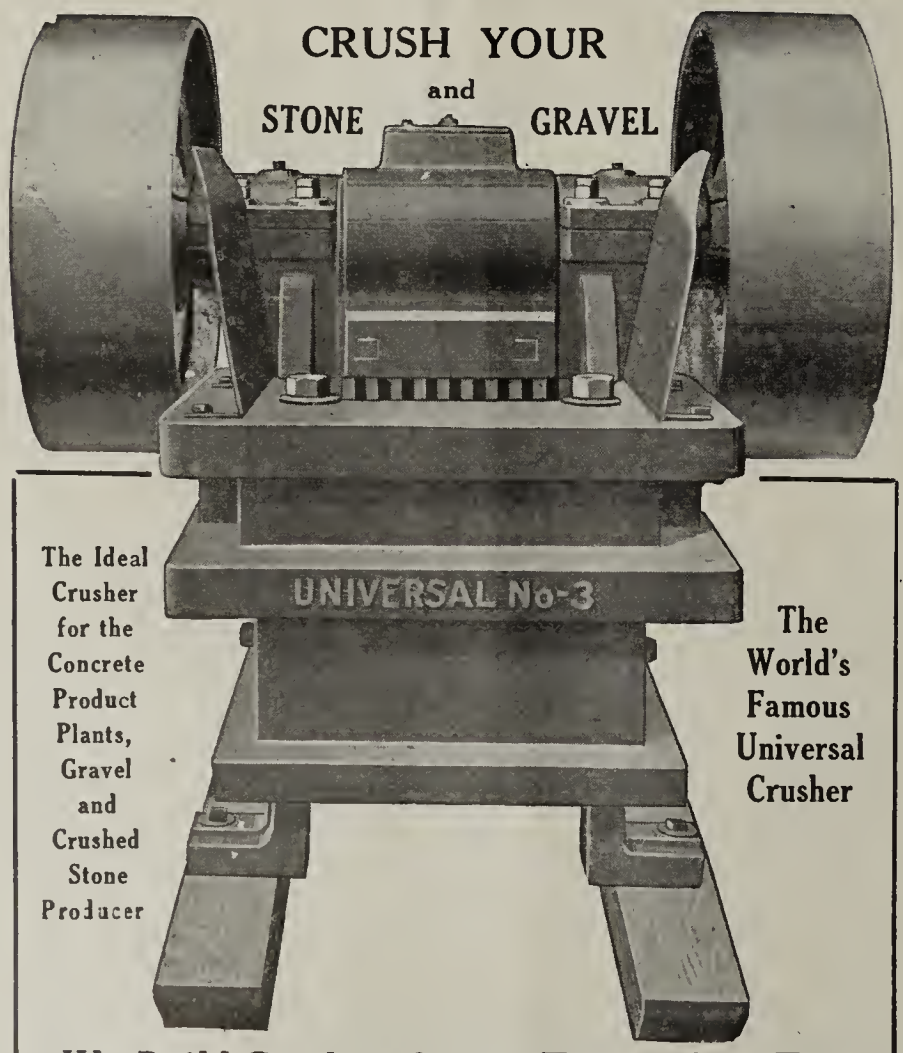
For Canadian Business refer to Canadian Allis-Chalmers, Limited, Toronto, Ontario, Canada

**Foreign Representatives**

Frank R. Perrot . . . 883 Hay Street, Perth, West Australia
Frank R. Perrot . . . 294 Clarence Street, Sydney, N. S. W
H. I. Keen, 732 Salisbury House, London Wall, E. C., London, England
W. R. Judson . . . Huerfanos 1157, Casilla 2653, Santiago, Chile.



CRUSH YOUR and STONE GRAVEL




The Ideal Crusher for the Concrete Product Plants, Gravel and Crushed Stone Producer

The World's Famous Universal Crusher

***We Build Crushers from 5 Tons to 300 Tons per 10-hour Capacity***

Instantly adjusted to produce size required from ¼ inch to 3 inches. *Write for Folder No. 14.*

## UNIVERSAL CRUSHER COMPANY

230 Bee Ave — Cedar Rapids, Iowa, U. S. A.



Strength Capacity

Convenient Adjustment

# Rock Crushers

## Stationary and Portable Types

The Austin Gyratory Crusher is built to withstand maximum strains, reducing breakages under severest service requirements. May be worked to full capacity over wide range of material, insuring uniform product.

The crushing head is made cylindrical to an extent equal to its length of adjustment, whereby the maximum opening is always maintained.

Easy adjustment, automatic oiling system, rigid eccentric bearing, countershaft supported on each side of driving pinion. Thoroughly protected from dust and grit.

Made in nine sizes—50 to 5,000 tons per day, stationary and portable types.

Send for full information on rock-crushing, road-surfacing and grading equipment of every character.

## THE AUSTIN MFG. COMPANY

**Chicago — New York**

# LOW COST BLASTING

With scarcity of labor and advancing cost of production to contend with, economic and efficient quarry operations are the problems confronting cement producers.

## By Using Red Cross Explosives

as described in MODERN QUARRYING an increased production of material for crushers and mills is assured. The selection of explosives, location of charges and approved detonation methods are described in a non-technical manner.

Get a copy of MODERN QUARRYING,—make 1918 a record year for high production and low-cost blasting. When requesting book please mention CEMENT AND ENGINEERING NEWS.

DU PONT

TECHNICAL DIVISION

**E. I. du Pont de Nemours & Co.**

WILMINGTON, DELAWARE

Powder Makers Since 1802

DU PONT

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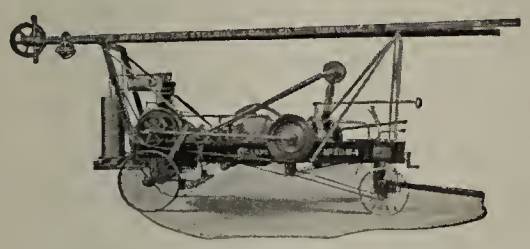
# A Big Blast-Hole Drill That's Reliable



## The Cyclone No. 14

Heavy, solidly braced frame — Sill timbers 4" x 14". All machinery placed directly on the main sills protecting it against strains and preventing top heaviness. **Eighty per cent (80%) of the castings are cast steel**—not cast iron. The Cyclone No. 14 is the only Blast-Hole drill so built. Furnished in Steam, Gasoline, Compressed Air or Electric Power; traction or non-traction.

**The Sanderson Cyclone Drill Co., Orrville, Ohio**

**Eastern and Export Office, 50 Church St., New York, N. Y.**

---

BECAUSE WE SPECIALIZE ON

**Lock Seam Pipe** with the smooth inside surface, having already furnished large quantities for Potash Recovery plants, we are able to give especially careful attention to the construction of this class of Pipe.

**Robertson Bros. Mfg. Co., Chicago**

---

# SOPER ENGINEERING CO.

ELLIS SOPER, PRESIDENT

CHATTANOOGA, TENN.

Designing, Constructing and Operating Engineers and Contractors

Cement Plants and Reinforced Concrete Bridges a Specialty

---

A CORDEAU-BICKFORD SHOT

54 holes, average depth 92 ft., fired by means of Cordeau-Bickford detonating fuse

# CORDEAU-BICKFORD

**An Instantaneous Detonating Safety Fuse**

## For SAFETY and EFFICIENCY

Particularly adapted to well drill shooting where large columns of explosives are fired, where it is desirable to break the charge in the drill hole, or where a great many holes are to be fired at one time.

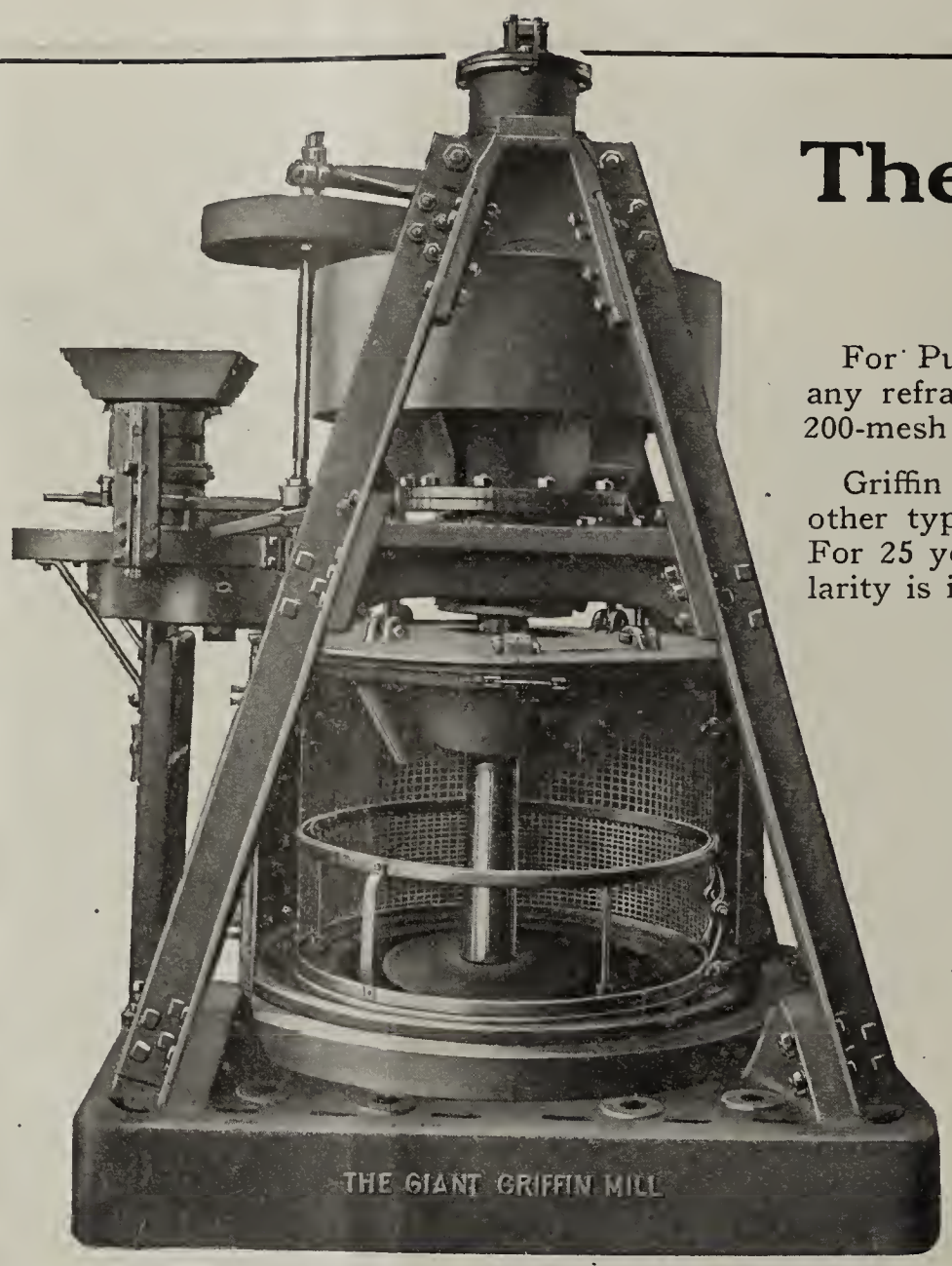
Cordeau is run from the top to the bottom of the drill hole in contact with the explosive charge—one continuous detonator.

RESULTS: Complete detonation, quicker detonation, greater shattering effect, lower secondary costs, substitutes a detonator which is insensitive to shock and friction in place of the electric caps.

*Write for booklets on Cordeau and Deep Well Blasting*

**THE ENSIGN BICKFORD CO., Simsbury, Conn.**

*Original Manufacturers of Safety Fuse* **Established 1836**




# The Improved Giant Griffin Mill

For Pulverizing Coal-Cement Clinker, Raw Material or any refractory material where a finess of 83% through a 200-mesh screen is required.

Griffin Mills are used by Cement Plants more than any other type of pulverizer. Now in operation in 45 plants. For 25 years they have led the procession and their popularity is increasing.

Recent improvements have reduced their former low H. P. and Maintenance Cost to the Minimum. Why not investigate this new Griffin Mill?

Recommended for Agricultural Limestone Producers as well as Cement Producers.

GRINDS ANY DRIED REFRACTORY MATERIAL.

Our Engineers Are at Your Disposal.

## Bradley Pulverizer Co.

**Works Allentown, Pa.**

**BOSTON** **LONDON**

Crushing Plant of the Oklahoma Portland Cement Co., Ada, Oklahoma.

When this Company installed the Traylor 36x72 in. Type C Jaw Crusher, they eliminated unnecessary waste of POWER, LABOR and COSTLY SHUTDOWNS for reasons fully described in Bulletin J1—GET IT.

## TRAYLOR ENGINEERING & MFG. CO.

New York Office: 30 CHURCH ST. | Main Office and Works: ALLENTOWN, PA. | Western Office: SALT LAKE CITY

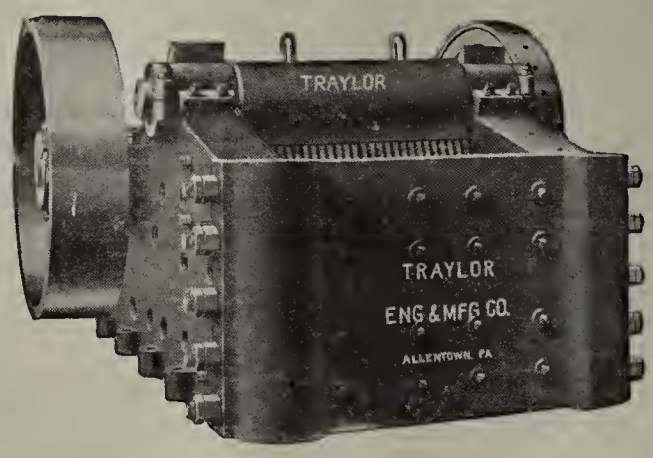
Chicago Office: 1414 FISHER BLDG.

# "IT'S A BEAR"

FOR CRUSHING HUGE PIECES OF STONE WITH EASE AND MINIMUM POWER CONSUMPTION

**THAT'S THE**

# TRAYLOR "TYPE C" Jaw Crusher



# Cement and Engineering News

Vol. 30 February 1918 No. 2

## Noteworthy Concrete Streets

Beacon Street, a section of which is shown below, is one of the aristocratic thoroughfares in Boston. Aside from the fact that it is a historic street in a historic city, it becomes noteworthy in engineering and pavement contracting circles from the fact that concrete was recommended after an exhaustive study of the different types of street paving material. The report in favor of concrete was made by a noteworthy commission appointed for that purpose, composed of Hector J. Hughes, Professor of Civil Engineering in Harvard University; James H. Sullivan, Division Engineer, Public Works Department; G. C. Emerson, Consulting Engineer, Boston Finance Commission; Chief Engineer of the Massachusetts State Highway Commission. It was constructed by force account, using labor furnished by the Public Works Department, under the direction of James H. Sullivan, Division Engineer.

# CEMENT AND ENGINEERING NEWS

(PUBLISHED MONTHLY)

**WILLIAM SEAFERT, Editor and Publisher**

Office—672 Transportation Building, Chicago

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Advertising copy or changes in ads. must be in this office by the 25th of each month, as hereafter our magazine will appear on the 5th of the following month

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CHICAGO, FEBRUARY, 1918


## Portland Cement in 1917 Breaks Record

The year 1917 holds the record for production of Portland cement, a total of approximately 93,554,000 barrels having been manufactured, an excess over the former high production of 1913 of nearly 1,500,000 barrels, and over the production of 1916 of more than 2,000,000 barrels, or 2.2 per cent. The shipments in 1917 of approximately 90,630,000 barrels fell below those of the record year, 1916, by nearly 4,000,000 barrels, or about 4 per cent. Stocks at mills increased more than 2,800,000 barrels, or 33.7 per cent, as compared with 1916.

Higher prices for cement prevailed throughout the United States except at a few plants in the Pacific Coast district. Higher prices were, however, accompanied by higher costs of manufacture. Demand for cement was generally very good during the first five to eight months of 1917, but showed a decided falling off during the remainder of the year. Labor and traffic conditions were, for the most part, unsatisfactory.

Three new plants reported the production of Portland cement in 1917: The Hercules, at Stockertown, Pa.; the Fort Dodge, at Gilmore City, Iowa, and the Beaver, at Gold Hill, Ore., and one plant, the Giant, at Norfolk, Va., resumed operations after an idleness of several years.

The following statistics were compiled under the direction of Ernest F. Burchard, of the United States Geological Survey, Department of the Interior. The figures for 1916, which are final, are based on complete returns; those for 1917, which are subject to revision, are based on preliminary reports from all but four of the manufacturers, the figures for those not reporting having been estimated.

**Portland Cement Output in the United States, 1916, with Estimate for 1917, in Barrels.**

| District | Actual 1916. | Estimate 1917. | Change (Per Cent.) |
|---|---|---|---|
| Lehigh district (Eastern Pennsylvania and Western New Jersey): | | | |
| Shipments | 25,360,287 | 24,476,000 | — 3.5 |
| Production | 24,105,381 | 24,548,000 | + 1.8 |
| Stock | 2,156,825 | 2,185,000 | + 1.3 |
| New York: | | | |
| Shipments | 5,603,477 | 5,429,000 | — 3.1 |
| Production | 5,643,677 | 5,512,000 | — 2.3 |
| Stock | 787,532 | 861,000 | + 9.3 |
| Ohio and Western Pennsylvania: | | | |
| Shipments | 8,123,492 | 7,321,000 | — 9.9 |
| Production | 10,360,563 | 10,989,000 | + 6.1 |
| Stock | 574,550 | 650,000 | +13.1 |
| Michigan and Northeastern Indiana: | | | |
| Shipments | 5,747,113 | 4,853,000 | —15.6 |
| Production | 5,521,876 | 5,249,000 | — 4.9 |
| Stock | 451,724 | 833,000 | +84.4 |
| Southern Indiana and Kentucky: | | | |
| Shipments | 3,266,215 | 2,416,000 | —26.0 |
| Production | 3,238,942 | 2,562,000 | —20.9 |
| Stock | 477,232 | 628,000 | +31.6 |
| Illinois and Northwestern Indiana: | | | |
| Shipments | 10,637,659 | 10,234,000 | — 3.8 |
| Production | 10,360,563 | 19,989,000 | + 6.1 |
| Stock | 1,193,341 | 1,860,000 | +55.9 |
| Maryland, Virginia and West Virginia: | | | |
| Shipments | 3,315,323 | 3,125,000 | — 5.7 |
| Production | 3,189,585 | 3,127,000 | — 2.0 |
| Stock | 235,511 | 240,000 | + 1,9 |
| Tennessee, Alabama and Georgia: | | | |
| Shipments | 3,541,572 | 3,713,000 | + 4.8 |
| Production | 3,502,259 | 3,679,000 | + 5.0 |
| Stock | 237,395 | 195,000 | —17.9 |
| Iowa, Minnesota and Missouri: | | | |
| Shipments | 11,178,790 | 11,442,000 | + 2.4 |
| Production | 10,592,234 | 11,966,000 | +13.0 |
| Stock | 852,549 | 1,348,000 | +58.1 |
| Kansas, Oklahoma and Central Texas: | | | |
| Shipments | 7,735,418 | 7,491,000 | — 3.2 |
| Production | 7,502,111 | 7,682,000 | + 2.4 |
| Stock | 380,695 | 600,000 | +57.6 |
| Rocky Mountain States (Colorado, Utah, Montana and Western Tex): | | | |
| Shipments | 3,141,855 | 3,104,000 | — 1.2 |
| Production | 3,097,385 | 3,270,000 | + 5.6 |
| Stock | 198,984 | 280,000 | +40.7 |
| Pacific Coast States (California, Oregon and Washington): | | | |
| Shipments | 6,901,095 | 7,026,000 | + 1.8 |
| Production | 6,830,454 | 7,656,000 | +12.1 |
| Stock | 814,140 | 1,500,000 | +84.2 |
| TOTAL | | | |
| Shipments | 94,552,296 | 90,630,000 | — 4.1 |
| Production | 91,521,198 | 93,554,000 | + 2.2 |
| Stock | 8,360,478 | 11,180,000 | +33.7 |

## Concrete Institute Meeting Postponed

On account of the congestion in the railways, particularly the difficulty of travel to and from Chicago, the Board of Direction of the American Concrete Institute on January 16 decided to postpone the annual convention of the institute until June 24-26, 1918, at Atlantic City. The convention had already been arranged to be held in Chicago February 7-9, and a program was off the press. This program, together with preprints of papers and committee reports, will be sent very soon to all members of the institute in the hope that written discussion will be made available for presentation at the June meeting. By that time it is expected that railway travel difficulties will have eased up considerably. Certainly they will not be subject to the present inconveniences due to weather. The meeting at Atlantic City is coincident with and just before the meeting of the American Society for Testing Materials, which has always been attended by a number of members of the American Concrete Institute.

# *Preliminary Reports of Tests*

## Of Crushed Slag and Slag Sand to Determine Their Suitability for Use as Concrete Aggregate

At the request of the Birmingham Slag Company, Birmingham, Ala., studies were made of the value of crushed furnace and foundry slag screened between ¼" and 1½" as coarse aggregates, and slag sand all below ¼" screen as fine aggregate for use in concrete.

This report includes results up to 28 days for various proportions and different combinations of the crushed slag and slag sand. Some tests in which Potomac River sand was used as the fine aggregate with the crushed slag as coarse aggregate, were also made. For comparison a series was made in which the aggregates used were Potomac River sand and gravel.

### Tests of Portland Cement Used

Chemical Analysis—Laboratory No. 18360

| | |
|---|---|
| Silica ($SiO_2$) | 21.43% |
| Iron ($Fe_2O_3$) | 2.85% |
| Alumina ($Al_2O_3$) | 6.71% |
| Lime (CaO) | 62.40% |
| Magnesia (MgO) | 1.92% |
| Sulphuric Anhydride ($SO_3$) | 1.63% |
| Loss on Ignition | 2.78% |
| Insoluble Residue | 0.21% |

### Physical Tests

| | |
|---|---|
| Fineness: Per cent Passing 200 Mesh Sieve | 80.7% |
| Soundness: 5 hours in steam | O. K. |
| Per Cent Water for Normal Consistency | 22.5% |
| Time of Setting: Initial | 4 hrs. 30 min. |
| Final | 7 hrs. 50 min. |

Tensile Strength:

| Mortar (1:3 Standard Sand) | | | |
|---|---|---|---|
| 7 days | 245 | 260 | 265 |
| 28 days | 385 | 370 | 360 |

### Tests of Slags

| Chemical Analysis | Crushed Furnace Slag (1½ - ¼") | Crushed Foundry Slag (1½ - ¼") | Slag Sand Below ¼" |
|---|---|---|---|
| Silica ($SiO_2$) | 34.96 | 37.22 | 33.84 |
| Iron (FeO) | .86 | .54 | 1.24 |
| Alumina ($Al_2O_3$) | 12.29 | 14.32 | 12.48 |
| Lime (CaO) | 41.59 | 44.68 | 40.56 |
| Magnesia (MgO) | 7.68 | 1.58 | 7.45 |
| Sulphuric Anhydride ($SO_3$) | 1.01 | .09 | .74 |
| Sulphide Sulphur | .59 | 1.08 | .58 |

### Physical Tests of Slag

Granular Analysis

| Marked | Per Cent Passing Screens 1½ | 1 | ¾ | Opening in Inches ¼ | ½ |
|---|---|---|---|---|---|
| Crushed Furnace Slag | 100.0 | 90.5 | 68.8 | 23.0 | 2.6 |
| Crushed Foundry Slag | 100.0 | 94.5 | 84.9 | 44.3 | 6.8 |
| Potomac River Gravel | 100.0 | 69.9 | 46.3 | 21.2 | 1.4 |

| | Per Cent Passing Sieves | | | | |
|---|---|---|---|---|---|
| No. | 3 | 4 | 6 | 8 | 10 |
| Openings | .263 | .185 | .131 | .093 | .065 |
| Slag Sand | 99.5 | 94.3 | 80.7 | 65.0 | 49.0 |
| Potomac River Sand | 100 | 100 | 99.6 | 97.7 | 95.2 |

| 14 | 20 | 28 | 35 | 48 | 65 | 100 |
|---|---|---|---|---|---|---|
| .046 | .0328 | .0232 | .0164 | .0116 | .0082 | .0058 |
| 36.8 | 25.9 | 17.7 | 13.2 | 9.7 | 7.4 | 6.3 |
| 92.2 | 85.9 | 70.1 | 50.0 | 28.1 | 15.6 | 8.0 |

### Other Physical Tests of Slag Aggregates

| Marked | Weight Per Cubic Foot | Specific Gravity | Percentage Voids (Computed) |
|---|---|---|---|
| Crushed Furnace Slag | 76.9 | 2.34 | 47.2 |
| Crushed Foundry Slag | 98.8 | 2.78 | 43.1 |
| Slag Sand | 85.5 | 2.56 | 46.5 |
| Potomac River Sand | 98.0 | 2.62 | 40.0 |
| Potomac River Gravel | 103.0 | 2.63 | 27.6 |

## Compressive Strength of Concretes

**Each Result the Average of Two 6 x 12 Cylinders Stored in Damp Closet 28 Days, Then in Air Outdoors**

| Composition—Parts by Volume. | | Per cent Water | Compressive Strength in Lbs per Sq. Inch. Age, Days 7 | 28 | 180 | 365 |
|---|---|---|---|---|---|---|
| 1 | Portland Cement | | .... | .... | ... | ... |
| 1½ | Potomac River Sand | 10.7 | 1933 | 2406 | ... | ... |
| 3 | Crushed Furnace Slag | | .... | .... | ... | ... |
| *1 | Portland Cement | | .... | .... | ... | ... |
| 1½ | Slag Sand | 10.6 | 1973 | 2850 | ... | ... |
| 3 | Crushed Furnace Slag | | .... | .... | ... | ... |
| 1 | Portland Cement | | .... | .... | ... | ... |
| 1½ | Potomac River Sand | 9.6 | 1753 | 3020 | ... | ... |
| 3 | Crushed Foundry Slag | | .... | .... | ... | ... |
| *1 | Portland Cement | | .... | .... | ... | ... |
| 1½ | Slag Sand | 9.0 | .... | 2690 | ... | ... |
| 3 | Crushed Foundry Slag | | .... | .... | ... | ... |
| 1 | Portland Cement | | .... | .... | ... | ... |
| 1½ | Potomac River Sand | 8.7 | 1778 | 2790 | ... | ... |
| 3 | Potomac River Gravel | | .... | .... | ... | ... |
| †1 | Portland Cement | | .... | .... | ... | ... |
| 2 | Potomac River Sand | 10.0 | 1396 | 2165 | ... | ... |
| 4 | Crushed Furnace Slag | | .... | .... | ... | ... |
| 1 | Portland Cement | | .... | .... | ... | ... |
| 2 | Slag Sand | 9.9 | 864 | 1565 | ... | ... |
| 4 | Crushed Furnace Slag | | .... | .... | ... | ... |
| 1 | Portland Cement | | .... | .... | ... | ... |
| 2 | Potomac River Sand | 8.7 | 1322 | 2689 | ... | ... |
| 4 | Crushed Foundry Slag | | .... | .... | ... | ... |
| *1 | Portland Cement | | .... | .... | ... | ... |
| 2 | Slag Sand | 8.8 | 953 | 1703 | ... | ... |
| 4 | Crushed Foundry Slag | | .... | .... | ... | ... |
| | | | 7 | 28 | 180 | 365 |
| 1 | Portland Cement | | .... | .... | ... | ... |
| 2 | Potomac River Sand | 8.1 | 1194 | 1949 | ... | ... |

| | | | | | | |
|---|---|---|---|---|---|---|
| 4 | Potomac River Gravel | .. | .... | .... | ... | ... |
| *1 | Portland Cement | .. .. | .... | .... | ... | ... |
| 3 | Potomac River Sand | 9.8 | 774 | 1328 | ... | ... |
| 6 | Crushed Furnace Slag | .. | .... | .... | ... | ... |
| †1 | Portland Cement | .. .. | .... | .... | ... | ... |
| 3 | Slag Sand | 10.0 | 519 | 592 | ... | ... |
| 6 | Crushed Furnace Slag | .. | .... | .... | .. | ... |
| 1 | Portland Cement | .. .. | .... | .... | ... | ... |
| 3 | Potomac River Sand | 8.0 | 985 | 1937 | ... | ... |
| 6 | Crushed Foundry Slag | .. | .... | .... | ... | ... |
| ‡1 | Portland Cement | .. .. | .... | .... | ... | ... |
| 3 | Slag Sand | 7.4 | .... | 1060 | ... | ... |
| 6 | Crushed Foundry Slag | .. | .... | .... | ... | ... |
| 1 | Portland Cement | .. .. | .... | .... | ... | ... |
| 3 | Potomac River Sand | 7.6 | 649 | 1210 | ... | ... |
| 6 | Potomac River Gravel | .. | .... | .... | ... | ... |
| *1 | Portland Cement | .. .. | .... | .... | ... | ... |
| 3 | Slag Sand | 10.2 | 961 | 1556 | ... | ... |
| 3 | Crushed Furnace Slag | .. | .... | .... | ... | ... |
| *1 | Portland Cement | .. .. | .... | .... | ... | ... |
| 4½ | Slag Sand | 10.0 | 537 | 924 | ... | ... |
| 4½ | Crushed Furnace Slag | .. | .... | .... | ... | ... |

Notes: * Some porous spots on surface, somewhat difficult to work. † Extremely porous surface, an unworkable mix. ‡ Surface very porous, very difficult to work.

### Summary

The tests and condition of cylinders indicate that there is insufficient fine material in the slag sand to produce a mix of sufficient plasticity to work properly in concrete work. Indications are that this may be corrected to a certain extent by increasing the ratio of the slag sand to the crushed slag aggregate but not entirely obviated except in mixtures rich in cement. It would, therefore, seem advisable, where slag sand is used, to add up to 15% of the weight of the cement of some material such as hydrated lime or fine sand.

The tests indicate that both the furnace slag and foundry slag are suitable for use as coarse aggregates in concrete. They are of equal or greater strength than the gravel tested in this investigation. The tests indicate that concrete containing foundry slag is somewhat sronger than concrete of similar proportions containing furnace slag as the coarse aggregate.

Six-month and year tests of most of the concrete mixtures will be reported as soon as completed.

(Signed) S. W. STRATTON,
Director.
H. A. D., J. C. P.

NOTE.—The slags referred to in foregoing report are both blast furnace slags. Basic slag from Tenn. Coal, Iron & R. R. Co.'s furnaces at Ensley, Ala., and Foundry or acid slag from Schloss-Sheffield Company's furnaces at Birmingham, Ala.—Birmingham Slag Company.

## Extra Dividends

The Pacific Portland Cement Company, San Francisco, has declared an extra dividend of $1.50 a share, payable at once. About three months ago this company—which is enjoying great prosperity—declared an extra dividend of $1 a share. The regular dividend disbursement is 25 cents a month.

## W. H. Simmons Resigns as Supt. Aetna Cement Plant

On November 15th last, Mr. W. S. Simmons resigned as superintendent of the plant of the Aetna Portland Cement Co., Fenton, Mich., after nearly eight years' service in that capacity.

During the first six years of that period, with no increase in machinery or equipment, Mr. Simmons increased the output of the plant by over 50 per cent.

During the last two years, in addition to operating the plant, the company built a new power house with 1,000 K. W. turbo generator unit and a new kiln room with capacity of 2,000 bbls. per day and installed two Allis-Chalmers rotary kilns which are considered the largest kilns in the world on two bearings.

## Crushed Gravel

Because prices of crushed rock have soared to a point that makes its use impracticable in city street repair work, A. L. Barbur, commissioner of public works of Portland, Oregon, will introduce specifications at the regular meeting of the city council, placing crushed gravel in direct competition with rock and crushed rock screenings.

Recently the city called for bids for crushed rock and screenings. When opened the lowest bid for crushed rock was found to be $1.35 laid down at the dock, as against 94 cents a cubic yard one year ago.

The bids were rejected by the council upon the recommendation of Mr. Barbur, who began an investigation to learn if crushed gravel could be used with the same results gained by the use of crushed rock.

In Seattle, it was learned, gravel has been substituted for rock in all street repair work, and satisfactory results have been gained.

By the use of gravel in the place of rock Mr. Barbur is confident that a large saving to the city will ensue and, in addition, gravel is considered to be more of a local product than rock. Gravel used for construction work is secured from the river channel with dredges, while the rock is secured from distant points and usually must be hauled from at least 30 to 50 miles before delivered.—*Portland Journal.*

## Road and Bridge Builders Wanted

### To Pave the Way for the Triumphal Entry of the United States Army Into Berlin

The chief of engineers of the United States Army, Major General W. M. Black, has asked the co-operation of this paper and of its readers in securing, for immediate service in France, road and bridge builders, woodsmen and lumbermen to enlist in the Twentieth Engineers, the largest regiment in the world, known as the Lumbermen's regiment. This regiment consists of 7,500 men, divided into ten battalions and thirty companies. The urgency of the need for the skilled men that will compose this regiment is indicated by the request that those who wish to enlist wire to the War Department at Washington.

Most interesting to most of our readers, probably, is the call for enlistment in road and bridge building units. There will be three auxiliary unit battalions of highway construction men, known as the 41st, 42nd and 43rd Auxiliary Forestry Battalions. Three thousand men are wanted for these at once. These will consist of men skilled in road building, bridge building, operating rock crushers, operating road rollers, driving motor trucks, ordinary road laborers.

Model, hygenic and sanitary homes for working people

# *Industrial Housing Problems*

If We Want Respectable and Intelligent Men and Women to Work in Our Factories We Must See That They Have Decent, Healthy and Comfortable Homes. Six Cement Companies Who Recently Analyzed Their Labor Turnover for a Period of Three Years, Report an Average of 103 Per Cent Per Annum.

Mr. Leslie H. Allen, who is chairman of the Housing Committee of the American Concrete Institute, here outlines the present industrial situation as it relates to housing and discusses points to be considered and problems that arise in the initiation and management of a housing enterprise. Mr. Allen's remarks are interesting. He said:

It is reported from Bucyrus, Ohio, that one manufacturing concern recently brought 150 employes to the city by great effort; after a few days thirty remained, the other 120 left, having failed to secure comfortable homes.

In Derby, Conn., one company was compelled to sublet to out-of-town concerns over $800,000 of work, which could easily have been done in the city if it had been possible to bring more mechanics to the city and house them.

Six cement companies, who recently analyzed their labor turnover for a period of three years, report an average of 103% per annum. A prominent public service corporation near Philadelphia confessed recently to a labor turnover of 1,100%, and, although this is exceptional, a turnover per annum of 400% is not uncommon.

These cases are typical of widespread conditions. During the past two or three years employers of labor in all of our big industrial centers have experienced such great difficulty in getting and keeping employes that much attention has been focused upon the employment situation. The results of many investigations have shown that one of the prime causes for the shifting population and large labor turnover of many industrial plants is the utterly inadequate housing accommodations available for the industrial worker.

In years gone by wages were low and the cost of turnover was hardly considered, for there was always a long line of new men waiting for a job, and, because of this excess of supply of men over demand, a man was not so ready to throw up his job and seek another. He would put up with poor housing conditions for the sake of having any job at all. But in the present labor situation, with demand far exceeding the supply, the workman will no longer be content with the disgraceful housing conditions he has had to put up with. He rightly objects to sleeping six or eight in a room big enough for two; turning out of his bed in the morning just in time for the night-shift man to take his place; and as fast as manufacturers bid for his services by putting up decent houses (as many are now doing) he is going to leave the old insanitary overcrowded centers to go to the new villages where he can live decently and comfortably with his wife and family.

### The Effect of Present Crisis

Very little is being done at the present time to remedy this state of affairs owing to the fact that the present abnormal prices of labor and building mate-

rials have shut off the supply of houses. Heretofore the demand for houses has been supplied by the speculative builder and the real estate operator. But at the present time he can no longer afford to build—in many cities he cannot get construction loans, and even if he does he cannot hope to sell in the open market at present prices and cannot be sure of any return on his money by renting, having in mind a possible trade depression during the reconstruction period which will come at the end of the war, so that, while the demand for better houses continues, the supply is getting less and less. In view of the probability that the labor situation will not change for four or five years after the close of the war, the manufacturer is faced with the very serious problem of how best to compete in the labor market for his needs, with the knowledge that housing is an important factor in which he will get no help from local investors as in former years.

He has long felt that the housing problem is one to which he ought to give serious attention. He has disliked doing so, and for good reason, but the present crisis is forcing upon him the conviction that he has got to tackle it, and that in the future he ought to control it.

### The Effect of Bad Housing on Industry

Apart from any consideration of this subject from the humanitarian or sentimental side, the industrial employer is beginning to realize the tremendous importance of these conditions in their relation to production.

He is finding out that men who are housed in unhygienic and unsanitary dwellings are not so healthy, not so efficient, lose more time through sickness and are more stupid and troublesome in the plant.

Statistics computed in Chicago and elsewhere have proved conclusively that the areas having maximum density of population coincide with those having the highest percentage of tuberculosis and other contagious diseases, crime and social evil.

The output of a plant is seriously affected by the prevalence of sickness which is so often caused by the unsanitary surroundings of the workman's house and the overcrowding inside. With open privies or cesspools in the back yards, and wells within twenty feet, typhoid is a never imminent danger; with overcrowding and lack of opportunity for personal cleanliness, tuberculosis and other diseases flourish; these reduce the regularity of the men's attendance at work and the production of the plant.

We are at last beginning to realize that people who live in pig-sties are likely to be and to act like pigs. If we want respectable and intelligent men and women to work for us in our plants, we must see that they have decent, healthy and comfortable homes.

The interest of the employer in the health of the employe is being shown in better sanitary accommodations in the factory, the provision of drinking-water fountains, shower baths, rest rooms and hospitals, and in recreation parks and club rooms, athletic associations, etc., and in some cases in the sale of wholesome food for the workers to eat during their dinner hour. And in so doing he has recognized the importance to his plant of happy, healthy employes. The provision of decent houses for them is but a short step further.

The human tool is not unlike the machine tool in this respect,—that the better it is housed and cared for the greater will be its efficiency and its output.

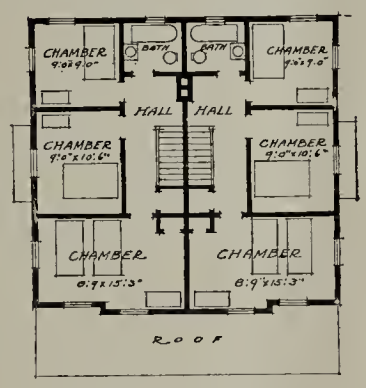
And so it is that we find in city after city and in many rural communities industrial plants are putting out large sums of money in building model villages or model homes for their working people. It is being recognized that in order to secure good workmen and to hold them it is necessary not only to provide work for them to do but to provide good houses for them to live in. It is no longer safe or good policy to leave

this matter to chance or to the irresponsible real estate speculator.

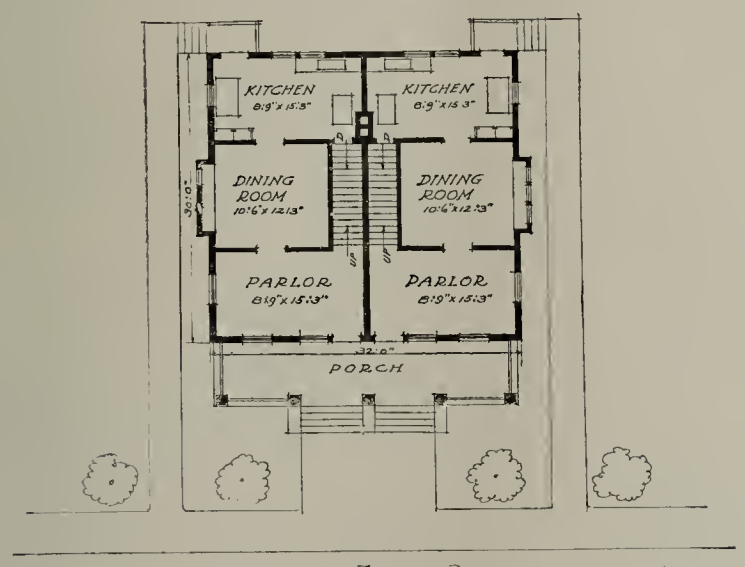
In February last the writer was discussing this matter with a textile manufacturer who said there might be some point in what was said, but he did not feel it was important enough in his plant, as the supply of houses took care of the demand. In September the writer saw him again. Fifteen per cent of his machinery was idle because his help would not stay. He stated that the cost of the houses he should have built in the spring would all have been returned to him in the profits on the output of his idle machinery.

### The Employer's Responsibility

Many experts think that it is undesirable for the manufacturing corporation itself to own houses and sell or rent them to the worker, if this can be properly taken care of by other parties. In spite of this, many corporations have been doing this successfully and maintaining harmonious relations with their work people. At the present time, with prices of building




SECOND FLOOR PLAN




FIRST FLOOR PLAN

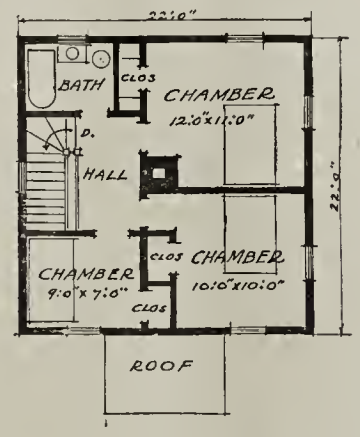
FRONT ELEVATION

TYPICAL SIX ROOM SEMI-DETACHED HOUSE

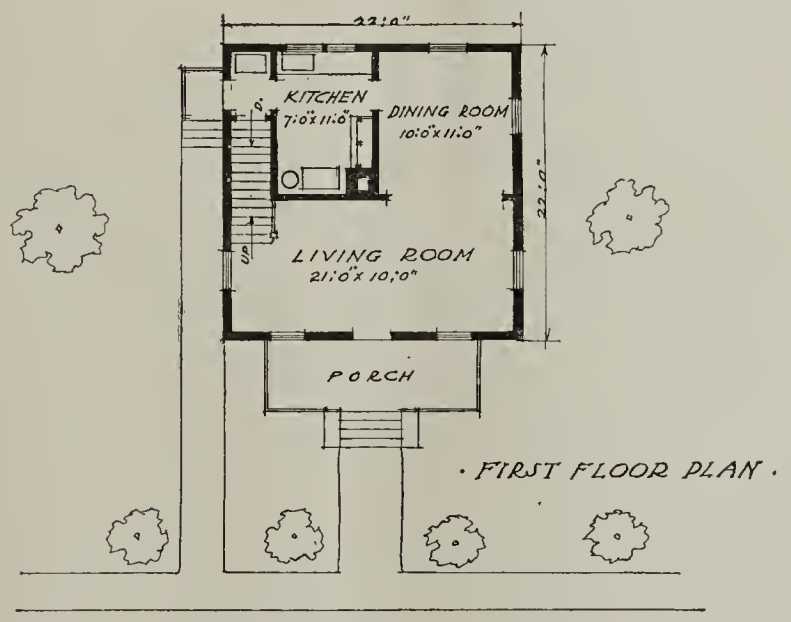
work at their present level, the employer is being forced into this field. No longer can a manufacturer build a large plant and find houses springing up all around it without any effort of his. The workers are the motive power of any factory plant, and the employer who builds a new plant today without building houses near by finds himself like a locomotive without fuel. Even in large cities such as Bridgeport, Akron, and many others, the manufacturers themselves have had to combine to raise the necessary capital to take care of and remedy the housing situation.

It is not absolutely necessary that the manufacturer or corporation should conduct real estate and building operations in their own name. It is easy to organize a separate corporation with a separate board of directors to carry out such work. Sometimes, when civic spirit runs high, other citizens or financiers in the town or village can be interested to a certain extent. But at the present time, when houses do not appear to be a remunerative investment, it is not likely that they can be induced to share the risk of such an investment. The employer, however, has got to build to hold his men, and if he cannot do so at a fair profit it is wise to write off a portion of the sum invested as a charge against operating expenses, the amount written off being considered as part of the cost of securing the men needed to operate the plant.

The question may arise as to whether it is best to pay a low wage and bear part of the employes' housing




SECOND FLOOR PLAN




FIRST FLOOR PLAN

FRONT ELEVATION

TYPICAL SIX ROOM HOUSE

expense as is usually done in rural communities or pay a high wage and let the employe pay the full cost of his housing, but the answer to this problem does not fall within the scope of this article and cannot be discussed here.

The manufacturer locating a new plant is faced with the fact that the factors which reduce the price of land must be paid for by increased expenditure in other directions, one important item of expense being the cost

of attracting help from distant labor markets. In many cases the amount sunk in housing without financial return may properly be charged against the low price of the land.

Mr. C. L. Close, manager of the Safety, Relief, Sanitation and Welfare Department of the United States Steel Corporation, has said in a recent article:

"The housing of employes requires the expenditure of large sums of money. That money must be taken out of the business. As part of the capital of the enterprise it must yield returns to those who have invested it. But money invested in building houses for employes will not bring any such return as money employed in the manufacture and sale of products of industry. Therefore, a board of directors is compelled seriously to consider how far it can properly withdraw capital for the construction of industrial houses and villages. It is easy to say that the diminished returns on this captial are made up by larger returns on the remainder of their capital, due to better work done by more contented workmen. We firmly believe this, but it is not a thing which can be demonstrated by the books of account. When doctrines of discontent are being preached to the workmen in so many ways, it is to be expected that employers must sometimes have misgivings as to their returns from endeavors to make their men healthier, happier and more contented.

"Behind all housing problems lies the most important one of all. An industrial enterprise must be so conducted that it shall earn enough to provide proper working conditions for its employes, to pay fair wages, and to return a reasonable profit to those who have invested their money in it."

We all agree on the last necessity. We are coming to see that the importance of the other two is almost equally great.

### The Building Problem

When the manufacturer has decided to build, he is faced with the problem of selecting the type of house he shall build, its size, number of rooms, materials of construction, amount of land per house, and so on. On these subjects there are as many differences of opinion as there are experts studying them.

The sentimentalist clamors for six-room houses and six thousand feet of land, public parks and playgrounds, etc.

The artistic architect focuses his attention on dainty dormers, pleasing porches, arty alcoves and the like.

The city social worker urges straight rows of flat roofed houses, built very cheaply, to get as many houses for the money as possible—the plainer the better, because cheaper.

The sanitary-minded concentrate on open plumbing, shower baths, and garbage-cans of the latest designs.

Some favor tenements only because they are sure to pay; to others they are anathema.

Then there is the concrete enthusiast who wants an indestructible house that will not show a dent if the miner misses his wife when he throws the pick at her and hits the wall by mistake. He would like a concrete bathtub, cement floors, concrete stairs, war garden on top of the concrete roof, a house that can be washed out with a hose once a month, etc.

We have also with us the town planner, whose interest lies chiefly in pleasing vistas, central features, preservation of natural beauties, and what not, regardless of land values.

The welfare worker does not care much what the house is like provided that proper supervision and regulation be enforced, the education and improvement of the tenant being to her of supreme importance.

And so it goes,—the unhappy manufacturer started on a new housing venture has embarked on a perilous voyage and must be wise as Ulysses if he would safely reach his goal.

Far be it from the writer to disparage or speak lightly of the ideals sociological, hygienic, artistic, financial or altruistic to which he has alluded. They all have their place, and it would be most unfair to suggest that all housing experts are cranks or visionaries. The fact that housing occupies such a large place in the public mind and that so many successful developments have been carried out is due almost entirely to the vision and enthusiasm of those who, seeing an ideal before them, have striven hard to awaken us to the need and the possibility of reaching it. It is only right that some recognition should be made here of the work of the National Housing Association in awakening us to the existing need and formulating standards for us to follow.

But it is also unfortunately true that many developments have fallen far short of the hopes of their planners because too much stress was laid on unpractical ideals and less important features so that housing planned for the workingman proved unsuitable for him.

The other day the writer visited some neat-looking four-room cottages. Outside they were as dainty as could be, but in neither of the bedrooms was there room for the workman's double bed, owing to the artistic arrangement of the dormers.

An architect was describing recently with some pride the ten cottages he designed a few years ago for a rural manufacturer. The finished result was so charming that they were snapped up by the manufacturer's sister-in-law, the village parson, the superintendent's aunt, the doctor and others; as no more capital was available, the housing problem in that village was no nearer solution.

### The Skilled and Unskilled Workmen

In order to arrive at some working basis to govern the laying out of new work, it will be well at this point to consider the essential needs of a workman's family in the light of present-day needs.

It must first be recognized that we have two classes of workmen to be considered: (1) The unskilled workmen, mostly foreigners or negroes, uneducated, unused to American houses and American standards of living, earning a very low wage, and (2) the skilled men, mechanics, machinists, etc., earning a higher wage, mostly Americans, living according to American standards, demanding more and willing to pay more for the comforts that the foreigner does not consider essential. The result of a failure to distinguish these two classes is that at the present time nearly all the houses built are American houses for skilled workmen, and the need for better houses for unskilled labor has remained unsatisfied, resulting in overcrowding getting worse and worse. Here and there, as in Philadelphia and Washington, a most excellent attempt has been made to solve the problem of housing the unskilled, low-paid workman. Such examples have not been copied, and only serve to show up more sharply the mistakes of other cities.

### Housing Essentials

The essentials of a modern city house may be summarized as follows:

Watertight roof, walls and floors.
Bedroom for parents.
Bedroom for male children.
Bedroom for female children.
Living-room for cooking, eating and general day use.
Private toilet-room with sanitay water-closet and sewer connection.
Suitable heating arrangements.
Running water supply fit for drinking.
Uninterrupted daylight and ventilation through win-

dows in every room.

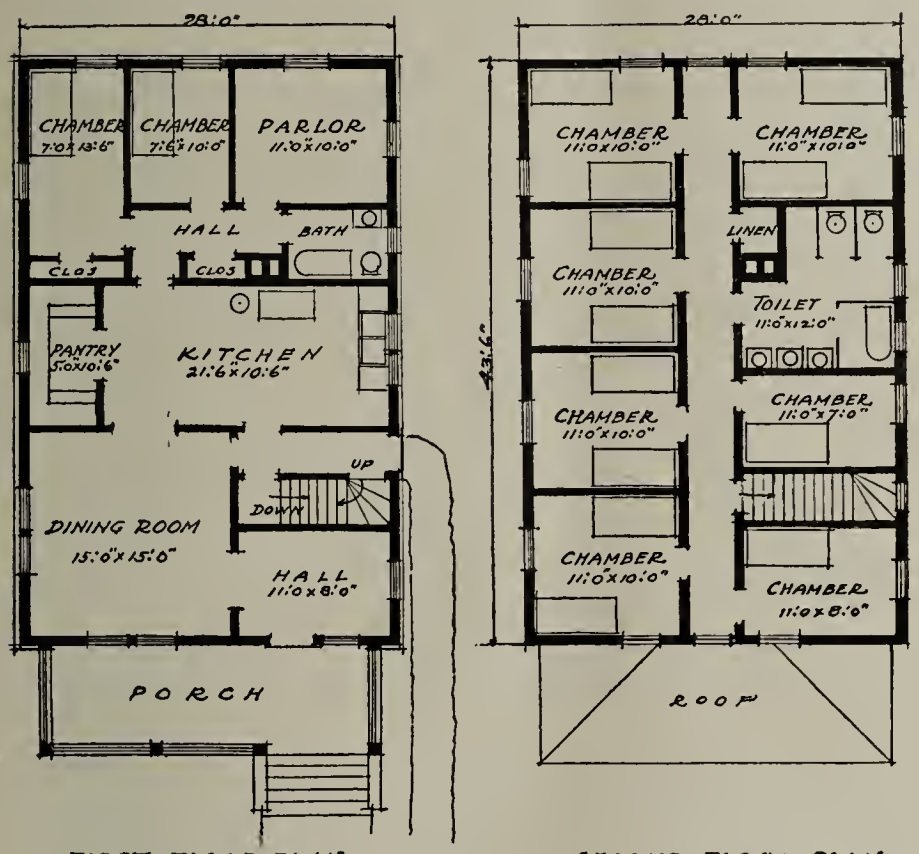
Sink in kitchen, with running water and waste.

Further additions required by the American family and considered necessary by them:

Cellars.
Closets.
Bathtub with running water.
Window screens.
Separate parlor.

Desirable improvements which usually are added:

Porches and piazzas.
Lavatory bowl.




FIRST FLOOR PLAN




SECOND FLOOR PLAN

WORKMEN'S BOARDING HOUSE
FOR 12 MEN

Hot-water supply to bath and bowl.
Window shades.
Window blinds.
Dining-room separate from parlor or kitchen.
Electric lighting or gas piping.
Wall paper.
Laundry tubs.

### Need for Economy

Any attempt such as the above to divide essentials from luxuries must come in for a good deal of criticism, as there is bound to be a difference of opinion upon the details of such a list. The classifications suggested will at least serve to indicate the lines upon which the planning of a house should be studied in view of the need for strict economy in designing and building necessary to bring buildings down to a cost that will be remunerative.

It is generally agreed by economists that the workingman cannot afford to pay more than one-quarter of his monthly wage in rent. This means that the man earning an average of $12.50 a week cannot afford to pay more than $150 per annum. Assuming that a housing operation ought to pay at least 10% gross per annum, this gives $1,500 for purchase of lot with sewer and street improvements and the building of a house. At the present time a four-room house of good construction cannot be built for this money and it is therefore necessary to plan with the very strictest economy.

Many of the workmen whose homes we wish to build have come from countries where four walls and a roof are considered a sufficient shelter from the elements to make a home. Although we do want to see them housed in a better manner than this, yet it is not necessary to give them a six-room house, large cellar, furnace heat with running hot water, laundry tubs, lavatory bowls, picture-mouldings, and all the other comforts and luxuries that are required by higher-paid workmen. We do want to house the lowest-paid man in a sanitary and hygienic home, but it is not necessary that this home be furnished with all the conveniences and appurtenances that are being considered necessary in the American home. We should give him a house that will not harbor vermin, that will not be damp or unhealthy, a house in which every room has a proper amount of light and ventilation and direct sunlight, and that has decent privacy in its sanitary accommodations and sufficient bedrooms for the sexes to sleep apart.

The various types of houses now in use are as follows:

(A) Single houses of five to seven rooms.
(B) Two-family houses of four to seven rooms.
(C) Terrace or row houses of four rooms and up.
(D) Apartment-houses or tenements, two rooms and up.
(E) Boarding-houses for single men.
(F) Hotels.

The single house is the ideal residence for the American family, but is beyond the means of the low-paid unskilled workman. A single house with five or six rooms with 3,000 feet of land cannot be built for less than $3,000 except in the cheapest kind of frame construction, and even at this price it would call for a higher rental than he can afford to pay. For higher-paid men in the plant the single house is very desirable.

The two-family house is often built for workers who wish to purchase their home. Though not suitable for the unskilled worker, they are quite attractive to higher-paid men who like to buy a two-family house so that the rental received from one-half of the house will help to pay the carrying charges and amortization of the whole house. In some cases these are built side by side with a party wall and in some cases one tenement is built above the other. The first-named is preferable, as there is more privacy.

One of the most successful houses for the unskilled worker is that known as the "Philadelphia" type of house, of which many thousands have been built in Philadelphia, Washington, and other large cities. The typical four-room Philadelphia house is two rooms deep and has a living-room and kitchen downstairs, two bedrooms and bath upstairs. It is built in long rows or terraces with party walls in between. These can be built on as narrow a frontage as 13′ 6″ (a 15′ frontage is desirable) on a lot of 900 square feet. The cost of both land and building is much lower than the preceding type. Houses built when prices were nor-

mal have been rented for as low as $12 a month and have shown a fair profit.

The building of houses in terraces is comparatively new in this country except in Philadelphia, although it is very common in European countries. It allows for a very little land per house unless the lots are very deep, but is desirable in many other ways. Each family has a direct entrance from the street without any common hallway and is not interfered with by other tenants overhead. The cost of heating the house is less owing to there being fewer outside walls. In a house two rooms deep each room has a proper amount of light and ventilation, and these houses have proved very successful wherever they have been used.

A recent variation of this type of house is the three-room two-family terrace house with one family on each floor. These are generally in demand by married couples without children.

The multiple dwelling or tenement house, housing from ten to fifty or more families, is undesirable from many points of view, and yet in crowded cities where land values are high is practically the only solution.

Apartments of all sizes can be provided, the most common arrangements being three rooms (kitchen, living-room and bedroom) or four rooms (kitchen, living-room and two bedrooms). Each apartment

**Concrete Residence**

should have its own private toilet and its own water supply.

Although city laws do not in every case require it, multiple dwellings ought in every case to have fireproof stairways and fireproof cellars, and care should be taken to see that every room and also the halls and stairs are properly lighted. In English cities the stairs are often built outside the building and each apartment is approached from balconies. This is in many respects a good way of building, and has been copied here in a few New York City buildings. This type of plan eliminates the common hall and inside stairs, which are frequently dark and difficult to keep clean and supervise.

There is always some demand in a large manufacturing center for small apartment-houses of two or three rooms with bath, etc., for married couples without children. They are not so desirable as homes for the workingman, and yet there are some mechanics who prefer them just as so many well-to-do people in our cities are content with and prefer this class of dwelling.

In rural districts many mills have built small boarding houses large enough to take care of from eight to a dozen boarders. The advantages of a small boarding house are that one man and his wife can run them, and the mill has no further responsibility. The men also prefer this sort of lodging to big company houses. The big disadvantage is that it is difficult to exercise any supervision over this sort of boarding house, and they may be misused or overcrowded. This far outweighs its advantages.

The old style of mill boarding house or hotel taking in a large number of employes has gone somewhat into disfavor. Under proper regulations this is a much better method of housing than in boarding houses or by allowing the families to take lodgers, but it is difficult to popularize it among the men. It will generally be found that the single worker prefers to lodge with a private family if he can possibly do so, but if this is impossible or if he is prevented by the owner and can be induced to take up his quarters in a large boarding house, he can be very comfortably housed at a very moderate cost. One that we have recently built takes care of sixty men at a charge of $1.50 per man per week. This building has a large dining-room and kitchen, etc., board being furnished at moderate cost.

The good points of the boarding house for fifty to sixty men are that one efficient married couple with three servants can run the place without difficulty. A higher type of tenant is required to handle a proposition of this kind, but they can be secured fairly readily. It is easier to arrange for proper inspection and supervision, as in most cases these are run as "company houses."

A boarding house for more than sixty is too big a proposition to be handled this way, and would have to be run like a hotel with a manager and regular hotel staff.

In London (England) and in Liverpool, the Rowton House Trust and other organizations have been operating hotels for five hundred or more single men successfully for many years, but up to the present time none have been built in American manufacturing centers.

### The Manufacturers' Local Needs

The industrial manager at this point may well stop in bewilderment, not knowing how to proceed next, what size and type of house he needs to choose from this list being quite a puzzle. On this point it is impossible for any expert to offer advice until his local needs are accurately determined, and to do this the only safe way is to institute a careful survey of the housing conditions and needs of his locality. It is very difficult to persuade him to do this, as each man thinks he knows just what his present conditions and needs are,—whereas, in point of fact, his guesses are often wide of the mark. The first and only impulse of many men is to build as many six-room houses as he can, adding, perhaps, a few seven and eight-room houses for good measure. Until he knows the number of married couples without children, he does not know how many small houses or apartments are needed. If he doesn't know the number of unattached single men, he doesn't know how many lodgers must be taken care of,—and unless he has facts before him as to the present habits and environments of those men he doesn't know whether in his town the lodger evil is the moral and social menace that the social reformer alleges it to be. He must know, too, the size of the different families with children, whether they are properly housed at present, and must have some facts before him on birth rates, death rates, sickness, and infant mortality, etc., compared with other cities, before he can be sure that his town needs improvement and what improvement it needs.

The only way of getting these facts is by a careful survey by an expert at this sort of work.

# Choctaw Cement Plant Busy Industry

No single industrial enterprise has done more to demonstrate the possibilities of development in eastern Oklahoma than has the plant of the Choctaw Portland Cement Company, located two miles south of Hartshorne.

The plant was started several years ago but the company which formed to erect it had financial difficulties, construction work suspended and the property was sold through the federal court. The purchasing company, headed by F. W. Freeborn, quickly completed the plant and placed it in operation a little more than a year ago.

### Capacity of 2,500 Barrels

Additions have been made to the plant until it now has a daily capacity of about 2,500 barrels of cement, and over 500 tons of crushed rock. It gives employment to nearly 300 men, many of them skilled laborers, and it is turning a mountain of waste into structural values at the rate of hundreds of thousands of dollars yearly.

It is probably the most modern cement plant in the southwest, and certainly is the most fortunately arranged with reference to the out-turn of its product. The plant is located at the foot of the big limestone mountain. Its quarries are at an elevation that provides for gravity transportation to the mill. In addition to this, there are located at convenient reach both the essentials of clay and shale.

### 500-Year Supply of Material

It is a natural cement deposit. Moreover, there are declared to be sufficient raw materials on the lands already controlled by the company to operate the plant for 500 years, which is as long as any ordinary business figures ahead—and sometimes a little longer.

Not only is the equipment thoroughly modern, but the general arrangement of the employes. There is a club-house and hotel of the most attractive design situated on the bank of Hartshorne Lake, itself one of the most picturesque and wholesome bodies of water in this part of the state. Then, for the married employes the company has constructed whole "streets" of little cottages, with sewer and water service, and sufficiently near the plant to make access thoroughly satisfactory and time-saving. A reservation of several acres has also been made on the south side of the plant for more pretentious dwellings, when the employes get to where they can afford them.

### Helps Town of Hartshorne

The industrial effect upon Hartshorne and the immediate vicinity has been marked. New business life has come into the town, as a result of the large monthly payroll created, and co-operation in the building of roads has been stimulated that is certain to work to the advantage of the whole community later in the establishment of better means of communication between country and town. The company itself constructed a pike from the town to the plant.

The output of fine road material is a standing invitation to the districts of the county to construct good roads, and this will be felt all the more with the return of normal building and industrial conditions after the war.

### Output Sold in Five States

In the distribution of its cement product, the Choctaw Portland Cement Company covers to advantage at least five states, carrying the Oklahoma trademark into many a foreign community and familiarizing the outside with the fact that we have in Oklahoma something besides oil, gas, coal and abundant livestock and agricultural products.

# Another Book by Professor Hool

Perhaps one of the best indications of the success of the series of "Reinforced Concrete Construction," being edited by George A. Hool, associate professor of structural engineering at the University of Wisconsin, is the fact that requests have been made for an extension of the series much beyond the original scope.

The third volume, which has just been issued, is devoted entirely to bridges and culverts. This is a wide departure from the original plan, it being the first intention of the author to complete in this volume the consideration of most of the other types of reinforced concrete structure not treated in the first two volumes of the series. There were a large number of requests, however, for a very comprehensive work on concrete bridges, making it seem desirable to devote an entire volume to this subject. Another volume will be required, therefore, to complete the series, if not more.

This book comprises almost 700 pages, and in its preparation Professor Hool has called in a number of other men who are specialists in their respective lines. Three chapters on "Construction Plant," for instance, are supplied by Mr. E. W. Ransome, three chapters on "Estimating" by Mr. Leslie H. Allen, three chapters on "Artistic Design" by Mr. William J. Titus, five chapters by Mr. Albert M. Wolf, giving in detail the construction of several important bridges, and two chapters on European practice on this class of work by Mr. A. W. Ayelett and Mr. P. N. Markmann. This, taken in connection with twenty-two chapters by Professor Hool regarding the general technical details of bridge design and construction, make a volume which is unusually complete and of far-reaching value. There are included in the work 575 illustrations and numerous tables, making it altogether a most valuable work for the bridge designer and builder.

The book sells for $3.00 net. Sent on receipt of price by CEMENT AND ENGINEERING NEWS, 672 Transportation Bldg., Chicago.

# New Publication

Building Supply News is the name of a new magazine that made its bow to the building material dealers. The News has concisely expressed its ideals as follows: "To bring to the building material dealers of America a dynamic force that will make for complete unity in the industry, for stimulation and guidance in more profitable merchandising, for the elimination of waste and lost motion and the substitution of practical economies in the handling and distribution of building supplies." The Kenfield-Leach Company, 445 Plymouth Court, Chicago, publishes the Building Supply News, and the subscription price is $2.00 a year.

# Cement Pipe Contract Let

The cement pipe yard of L. A. Lopez at Baldwin Park, Cal., near Los Angeles, has just undertaken a contract to make and lay 7,000 feet of cement pipe of three dimensions to be used in a big land development project close to that city. The plant, which is one of the town's early industrial enterprises, is now kept running at full capacity.

# Quick-Setting Cement Process

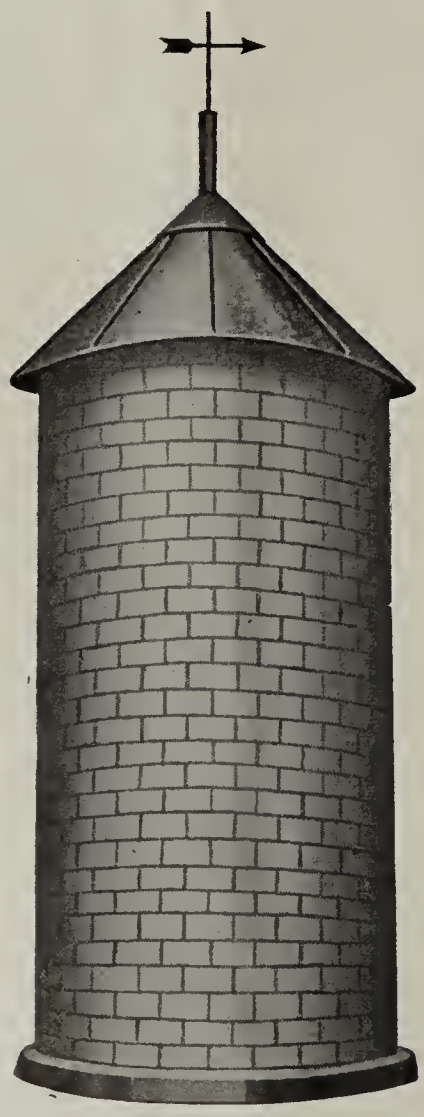
A deal has just been consummated, whereby the Tyler Henshaw interests in the Riverside Portland Cement Co., with headquarters in San Francisco, have secured from C. H. Harwood, former newspaper reporter, and J. L. Goffette, a Belgian engineer, the rights of a quick-setting cement process. It is understood the price paid was $250,000.

# Concrete In Silo Construction

Once the value of the article to be constructed has been clearly determined, the question of permanency in construction becomes a matter of prime importance. The magnificent triumph of the silo in the last five years marks the greatest innovation on the farm since the coming of the self binder. It demonstrates beyond all doubt that every American dairy or stock farm is either going to have to invest in silos and conserve the 40 per cent of nutriment formerly thrown away in the cornstalk or withdraw from the business. The reclamation of that 40 per cent means an increase in production of 66⅔ per cent, and that is a trifle not to be overlooked. The silo has doubly vindicated itself. So now the American farmer is facing the problem of durability in silo construction.

Today the farmer is asking himself this question, "What kind of a silo should I build?" Such a question can be answered only by carefully considering the demands that silage makes on the silo. These demands have received much publicity of late and have become well known to all reading farmers in the country. The silo must be air-tight and water-tight, and smooth on the inside to facilitate settling. Any silo answering these demands will keep silage and keep it well, as long as it meets them. But they are merely the primary requirements, and there are several other things to be considered by the prudent builder.

Fire, wind, rats, mice, dry weather, and wet weather all take a hand in determining whether the silo will continue to be air-tight and water-tight. With these considerations enters the problem of durability, and with the consideration of durability enters some differences of opinion. All this difference of opinion seems to hang on cost. However, it merely is a matter of what the farmer wants. If he desires a temporary silo, it is unwise for him to pay the higher price necessary for the concrete type. If he wants a permanent silo, it is very foolish economy for him to invest in a rapidly deteriorating type because it is originally cheaper. No one today denies that the concrete silo is more durable, no one with experience denies that the concrete silo will keep ensilage and keep it well. It is only a question of whether the farmer wishes to spend more money and get a more durable building.



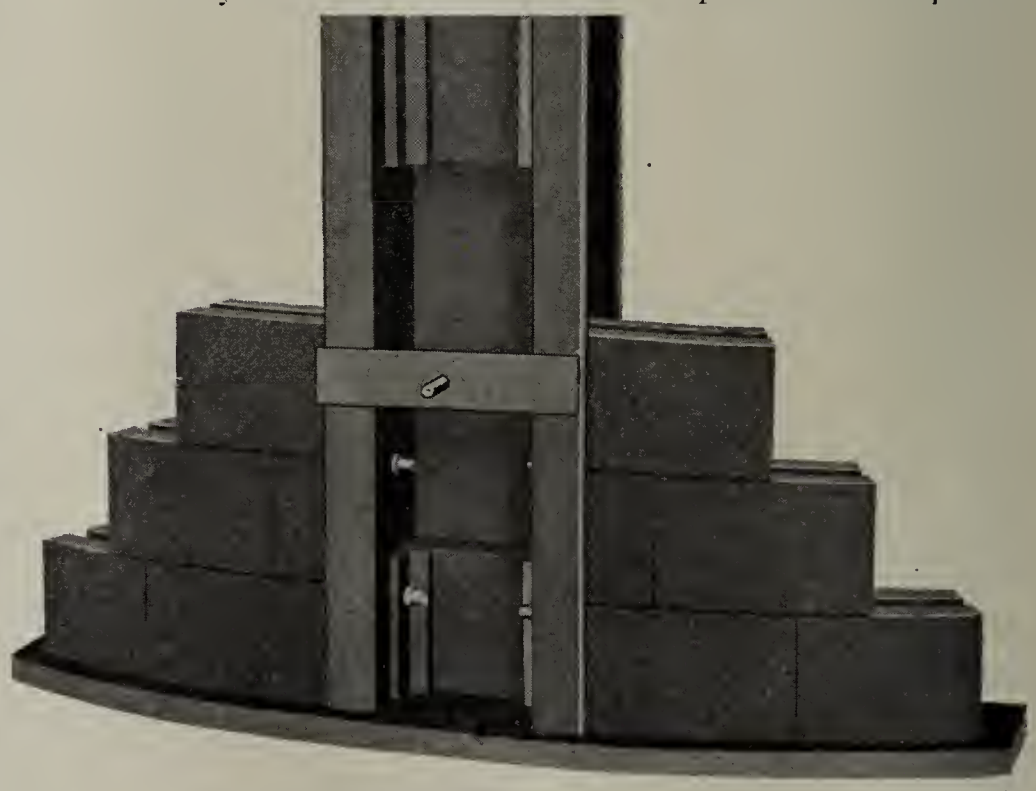
A silo built of concrete blocks on the Superior Automatic Silo Block machine. Easily constructed. Economical and airtight.

Concrete as a material mets well with the demand for permanency. It laughs at the wind and fire, rats and mice, dry and wet weather. Properly constructed, the concrete silo is not subject to burning, bulging, bursting, shrinking, swelling or perforations by rats and mice. It steadily rebuffs all the attacks that weaken and finally destroy silos made of other materials. It is pre-eminently the material for permanency. In fact, there is no reason why a well built concrete block silo should not last forever. All engineers regard the strength of concrete as cumulative. The story that silcage juices deteriorate concrete is entirely without foundation and has been disproved by hundreds of concrete silo users.

Concrete offers another advantage in silo construction in that it allows the builder to go high. The high silo secures greater pressure and thus makes better ensilage.

The greatest triumph in silo construction and the most wonderful opportunity for new business in new fields with absolutely tried, tested and proved methods of constructing silos and the only silo of its kind in the world is a silo built of concrete blocks by the Superior Automatic Silo block machine. A silo made of these blocks is so thoroughly re-enforced that it will stand like a sphinx in the desert against the fierce attacks of acids and gales that make short life of so many other silos.

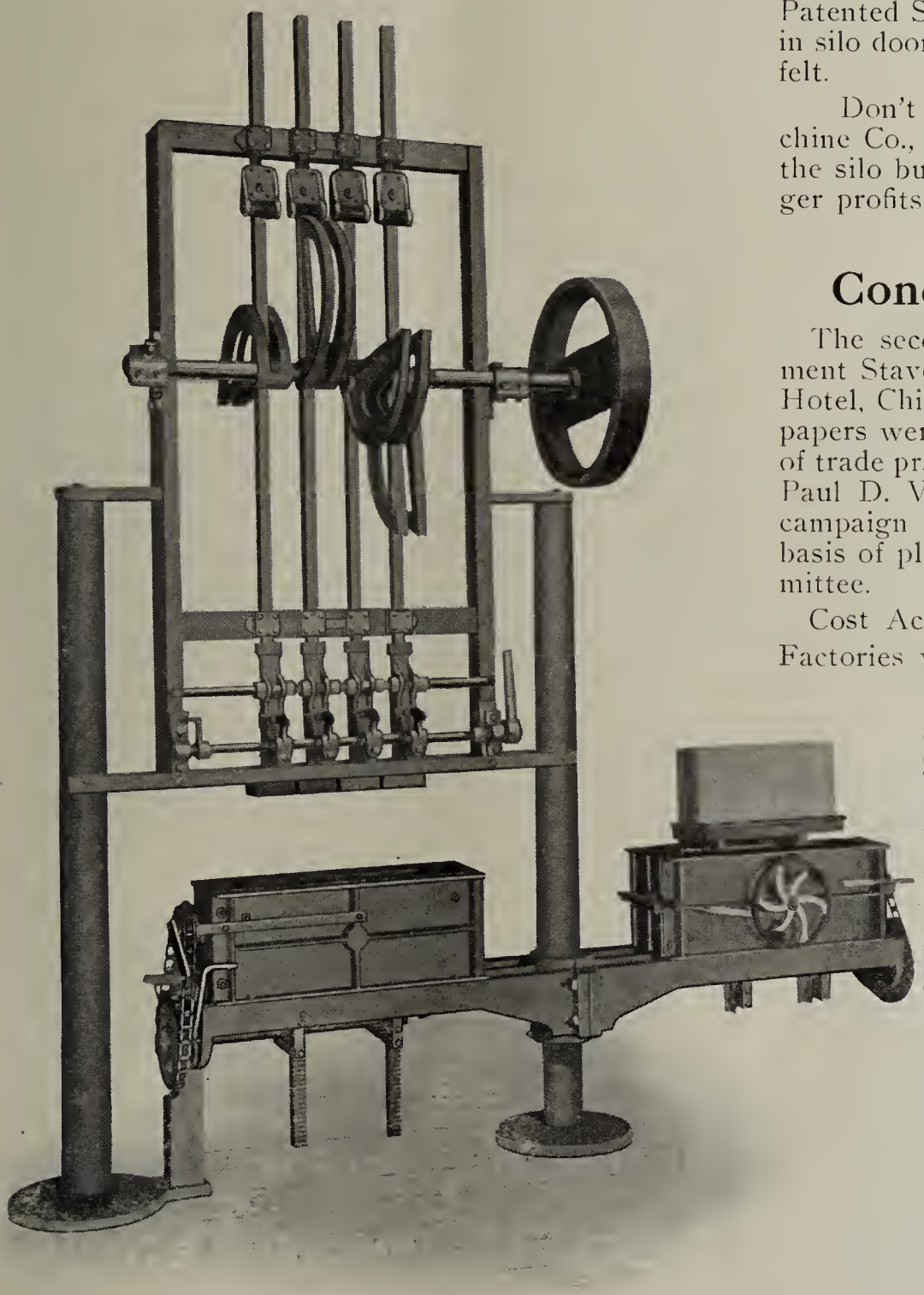
The Superior Concrete Machine Co., North Judson, Ind., has the greatest money-making proposition for the wide-awake contractor. This company was recently formed to manufacture and put out the Superior



Miller Steel Door Frame set in cement blocks made by the Superior Automatic Machine

Without a good door frame it is impossible to build a good silo. The Miller Steel Door Frame is so constructed that the doors are air tight without using any kind of packing on the doors. The door rests on all four sides on a point of contact one-eighth of an inch wide and one-sixteenth of an inch raise and with a pressure of 150 pounds against the door will make an impression on the wooden door that will make it absolutely air tight.

Automatic Silo Block Machine and the Miller Silo Steel Door Frame; having purchased and taken over the patents from Mr. A. D. Miller, the inventor of both the door frame and the machine, as well as the Concrete Silo Block, which is also patented and invented by Mr. Miller. This concrete silo block is the supreme result of many years of untiring effort and exhaustive investigation. Brought to perfection after long scientific analysis of ensilage and studying the shortcomings of all other silos. The Superior Concrete Silo Block built silo is the only practical silo that every agricultural expert will unhesitatingly endorse. It is the most notable achievement in silo design and construction and will soon be the Standard Silo in America, as it is indestructible and guaranteed absolutely against cracking from any cause.



**The Superior Automatic Silo Block Machine**
**Three men can make a large silo a day with this machine.**
An automatic measuring device is supplied with this machine

The Superior Concrete Machine Company manufactures an automatic concrete silo block machine for making a special patented tongue and grooved block, and which is reinforced in the silos with rods between each row of blocks in the groove and the rods are fastened at each end on the Miller Patented Steel Door Frame. Contractors are assured of a good profit in the manufacture of silos made with this machine owing to the speed and low cost of manufacturing possible with its use. Three men can make a large silo a day. The machine is supplied with an automatic measuring device.

The company is not selling the machine to manufacturers of the cement stave at this time, but are furnishing them only to manufacturers of their patented cement block. They supply molds and pallets. The machine is in fact a double block automatic tamping machine which makes great speed in the making of cement block silos. The block is far superior to the stave, the company declares, as there is no cracking of blocks as in the stave silo and the silo is reinforced between each row of blocks. The company further declare they have absolutely the best proposition on the market and it is new and worthy of the consideration of all concrete men who are considering the engaging into the manufacturing of concrete silos. The Miller Patented Steel Door Frame is absolutely the last word in silo doors, as it is unnecessary to pad the doors with felt.

Don't delay writing to the Superior Concrete Machine Co., North Judson, Ind., if you are interested in the silo business, as here is where you can make bigger profits.

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## Concrete State Silo Men Meet

The second annual convention of the National Cement Stave Silo Association was held at the Morrison Hotel, Chicago, December 4 and 5. Decidedly helpful papers were presented, among which was a discussion of trade practices, illustrated by charts, by E. M. Heim. Paul D. Van Vliet outlined a suggestive advertising campaign for the association, which was to form the basis of plans developed later by the advertising committee.

Cost Accounting Systems for Concrete Stave Silo Factories was the subject of a talk by O. K. Goree,

A motion to change the name of the association to the National Concrete Stave Silo Association, and to designate the product as the concrete stave, was voted down, because of the belief of some individuals that the change in name to the correct designation would reduce the effectiveness of the work already done to popularize the concrete stave.

Other papers were "Steam Curing vs. Dry Curing," J. B. Frahm, Davenport, Iowa; "Leasing and Agency Schemes," by Kent Merry, Wichita, Kans.; "What Constitutes Proper Reinforcing for Concrete Stave Construction," W. G. Kaiser, Portland Cement Association; "Choosing the Kind of Aggregate Best Suited for Concrete Stave Construction,"

J. E. Freeman, Portland Cement Association; "Bulk Cement," G. E. Warren, Universal Portland Cement Co.; "Stover Silage," R. T. Jenny.

It was decided that co-operation of members of the association be used in the purchase of advertising literature for the coming year, and an advertising committee was appointed to prepare suitable literature, which will receive the imprints of members and be distributed by them or from the head office, and be supplemented by individuals as desired.

E. N. Heim, of North Liberty, Ind., was elected president for the ensuing year, and L. H. DeMuth, of the Portland Cement Association, was chosen secretary.

# *Cracks in Concrete Pavements*

## Conclusions from Seven-Year Investigation by U. S. Office of Public Roads—Setting Contraction Wetting and Drying—Waterproofing

Specialists of the Office of Public Roads of the U. S. Department of Agriculture have recently concluded a seven-year study of cracking in concrete pavements, which has included measuring the amount of expansion and contraction caused by alternate wetting and drying and by temperature changes in concretes of various proportions of ingredients. The results are given in a report just issued by the department.

The report makes no attempt to apply the results to the practical side of road construction, although certain general conclusions drawn, it is said, may be capable of utilization by engineers. These conclusions are:

1. Neat cement, when allowed to dry, first contracts rapidly, then more slowly. The amount of contraction seems to vary with the cement, size of specimen, and condition of atmosphere in which drying takes place. The amount at 28 days is about 0.1 per cent and at 6 months about 0.2 per cent.

2. Mortar contracts on hardening in air and expands on hardening in water. The contraction in warm, dry air at 28 days is about 0.045 per cent for 1:2 and 1:3 mortar and at 6 months is 0.078 for 1:3 mortar and 0.085 for 1:2 mortar. The expansion in water is 0.01 per cent for 1:3 and 0.017 for 1:2 mortar at 28 days, and at 6 months 0.013 for 1:3 and 0.02 per cent for 1:2 mortar.

3. Both 1:2:4 and 1:3:6 concrete contract on drying in warm, dry air from 0.02 to 0.04 per cent at 28 days and from 0.04 to 0.07 per cent at 6 months. When hardening in water an expansion of about 0.01 per cent takes place at 28 days and 6 months in 1:2:4 and 1:3:6 concrete.

4. The richness of the mix of concrete seems to exert a small influence on the contraction; the richer the mix the greater the change in length.

5. Concrete alternately wetted and dried may be made to expand and contract owing to these causes. The expansion due to wetting is more rapid than the contraction on drying. The thoroughly dried specimens of concrete do not recover their original wet length when immersed.

6. Concrete stored in the outer air and exposed to the weather does not contract to the same extent as the above described specimens except under very dry conditions.

7. A waterproof covering, such as coal tar, prevents the rapid change in moisture content and greatly retards the expansion and contraction.

8. Reinforcement decreases, but does not prevent the shrinkage and expansion of concrete due to drying and has no effect on temperature changes. Reinforcement cannot, therefore, entirely prevent cracks, but seems to distribute them and keep them small.

9. Concrete roads are affected by both temperature and moisture. When the drainage is good and the sub-base not wet the temperature effects seem to be most important. A wet sub-base may add to the temperature expansion by about 0.01 to 0.02 per cent. The restraining effect of friction at the base seems to be almost negligible when figuring temperature and moisture expansion and contraction. In very dry climates shrinkage due to drying must be added to contraction due to fall in temperature. A shrinkage of 0.04 per cent (one-quarter inch in 50 feet) is a safe allowance due to drying.

10. Temperature at time of construction of road should be considered in designing joints. Cold-weather construction requires a full allowance for temperature expansion and, on wet sub-bases, for moisture expansion also. Hot-weather construction theoretically requires no joints at all, even in wet sub-bases, as the temperature contraction exceeds the moisture expansion. However, the difficulty of keeping the cracks clear probably renders joints imperative.

The report is published as Bulletin 532 of the Department of Agriculture, which will send it free on application.

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## Stucco Shipped as a Dry Material

The Garden City Sand Co., 25 North La Salle street, Chicago, has placed upon the market a product known as "Stonekote," which they declare is the only cement plaster for all exterior surfaces—rough cast, float coat, trowel finish or polish finish. It is a colored and waterproofed Portland cement scientifically com-

A Stonekote Residence

pounded and mechanically mixed ready to use by adding water only. You can have any shade of colors in reds, browns, grays, slates, buffs, orange, white and tans. They will gladly send any of our readers their new booklet.

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## How to Make and How to Use Concrete

Ransome Concrete Machinery Company, 115 Broadway, New York, N. Y., has sent us with the season's greetings a copy of "The Ransome Book, How to Make and How to Use Concrete," by H. Colin Campbell. This is one of the handiest abridgments of the scores of technical books on concrete that we have seen—the information that the contractor wants is contained there in a nutshell. Tables that a practical man can understand and use without asking a man with a degree what they mean and how to use them. There isn't anything in the mixing or placing of concrete that the busy man wants to know quick—barring how much it costs—that isn't there in shape for quick use. And there is data on how to figure the cost, provided the prices of the requisite factors are known. It's a little book worth having. Write for copy and mention Cement and Engineering News.

# Concrete Storage Cellars

This year, more than ever before, the farmer should be taught the need of conserving resources. Every year millions of dollars worth of fruits and vegetables go to waste either because storage facilities on the farm are unsuitable, or because crops are at once marketed when harvested and large quantities rot on the market before they can be sold.

No farm should be without some kind of a storage cellar in which root crops, such as beets, potatoes and

Familiar type of storage cellar

similar vegetables, can be held for market or feeding as the case may be, throughout the winter. In some cases limited storage space can be arranged in a cellar or basement of one of the outbuildings. Usually, however, such buildings are without cellars, so the logical solution of the root, vegetable or apple storage problem is a special building for the purpose. The saving that results from properly storing farm products so that they can be distributed to market evenly throughout the year soon returns many times the cost of storage space. Not many years ago the farmer rushed the harvesting of crops solely for the purpose of converting them into cash at the earliest possible moment. Sometimes this practice might have been profitable, but it is safe to say that on the average, crops so sold bring such a low figure that a careful estimate will show the sale was made at a loss.

There are two types of fruit and vegetable storage cellars or buildings—those which use some mechanical or other means to lower the temperature below that of the outside air and those which depend upon temperatures secured from atmospheric changes. The first are called cold storages, while the second are simply cool or common storage rooms. The first class may be subdivided into those which use mechanical refrigeration and those which use ice. Pits and ditches are also used, but more often for various kinds of vegetables than for fruits. On the average farm mechanical refrigeration is not convenient to provide. If more farms had facilities for storing ice in the winter so that a summer supply would be available, it would be a very simple matter to have real cold storage.

Potatoes, apples and similar products may be preserved in good condition by storing in what really amounts to a cellar; that is, the structure is built practically under ground because covered on all sides with earth. This helps to maintain the inside temperature at a desired low level and thus protects the contents from sudden changes in outside temperature. The modern root or vegetable cellar is an extension of the old practice of digging a hole in the ground, covering the crops to be stored with straw or dry leaves, then covering the whole pile with sufficient earth to prevent freezing and leaving some kind of vent opening at the top of the mound for ventilation. To handle large quantities of crops in this way where they are raised on a commercial scale, it is usually out of the question. Each year a large amount of labor must be expended on the work of housing and this is practically lost. A suitable concrete storage cellar will soon return its cost, make it easy to get at the contents whenever and as often as desired, and will permit handling economically a larger quantity of roots, fruits or vegetables.

There are a number of important requirements to observe if the results of one's labor are to be permanent. In localities where plenty of timber is available, this seems at first glance the best material to use. Everyone knows, however, that regardless of the kind of timber used for underground construction, the fact that it is constantly in contact with the soil causes rapid decay. Every few years, therefore, the wood structure must be practically rebuilt. Concrete, therefore, solves this problem and solves it at moderate cost.

Fruit cellar convenient to orchard

It is not possible to offer a design for a concrete fruit and vegetable storage cellar that will meet every individual requirement. It is possible, however, to briefly summarize the essential features of such a structure, which then leaves nothing to be done but to decide upon the size of structure needed. Refer to pages 8 and 9.

A concrete root or vegetable storage cellar should preferably be located at one side of a knoll or hill so that a portion of the structure at least can be set in the

ground and the remainder of its exposed wall surface and the roof, after finished, be easily banked and covered with earth from the excavation. Two feet of covering should be the extreme amount placed on the roof. More is not necessary and unless designed for heavier loads, more might not be safe. If, where the structure must be located, ground is level, it then becomes necessary to dig more of an excavation and build a greater portion of the building underground.

Concrete root cellars may be of block or of monolithic construction. Monolithic concrete is far preferable, since it is more likely to be water-tight. A 1:2:4 or 1:2½:4 mixture composed of well-graded sand and pebbles mixed with enough water to form a quaky consistency, will give water-tight construction. The walls must be reinforced properly to withstand earth pressure. The roof likewise must be reinforced. In setting up forms they should be well braced so that when the concrete is placed the walls will be true to line after forms are removed. Concrete for the roof should be a 1:2:3 mixture. Roof forms should be left in place to support the slab for at least two weeks under favorable weather conditions and perhaps longer under less favorable conditions to prevent any possibility of failure which may occur if forms are removed too early.

One very important detail of storage cellar construction is that there be adequate ventilation so that suitable atmospheric conditions can be maintained in the storage and excessive dampness be prevented from condensation of moisture in the air. There are conditions of location where it is advisable to "veneer" the inside wall surface of monolithic concrete with hollow block or tile so as to introduce a dead air space similar to that which would be used in ice-house construction to better insulate the wall and thus prevent outside changes of temperature from influencing in any marked degree the temperature inside the cellar. Double monolithic walls can be constructed to secure the same result.

Where the location of the cellar is such that there may be considerable water taken up by the soil during heavy rains, it would be well to provide 8 or 10 inches of gravel or cinder subbase for the concrete cellar floor. This subbase should be of clean material firmly compacted in layer before the concrete is laid. To prevent water from being retained beneath this floor, the subbase or fill, upon which it is laid, should be connected to a tile drain to insure free drainage from beneath the floor.

One of the best-known ventilating systems for farm structures is the King system. This can readily be adapted to the requirements of fruit and vegetable storage cellars. It is merely a matter of properly placing pipe flues in the concrete wall and arranging suitable inlets and outlets.

If it is not desirable or possible to build the storage room below ground, then insulation of walls and roof by introducing a confined air space becomes imperative to prevent excessive dampness in the structure from condensation, and to prevent freezing of contents during severe cold weather. For such a condition, hollow concrete block may be used but the walls must be suitably reinforced to withstand the outward thrust of stored contents. Only high-grade concrete blocks should be used, and they should be well laid in cement mortar so that joints will be perfectly tight.

Roof construction can be made of the insulated type by using any one of the different styles of metal lath and applying cement plaster inside and out. In roof construction of this kind it is, of course, necessary that the plastering be thick enough to be water-tight and that a dense, rich plaster be used.

Bins have to be provided to prevent piling contents too deep or in too great bulk. It is always well to put a wood false floor in storage cellars so that air may circulate all around the bins and through the stored products, thus contributing to maintaining conditions more favorable to the keeping of the fruit or vegetables. Wood planking should be used for bin partitions as well as for false floors and all of these should be made in units so that they can be readily knocked down and reassembled to form compartments of different sizes if required.

But little heat is necessary in a properly built aboveground structure to maintain a temperature that will safeguard against freezing even during extreme cold spells, one or two oil lamps or an oil stove being all that is required.

The storing and marketing of farm products have assumed an importance rivaling that of production itself, but the farmer who provides for large harvests by ample storage in a permanent concrete structure

Foundation of greenhouse used as a storage cellar

will have no cause to worry over price manipulation. He will be in a position to reap the deserved reward of his industry and forethought.—We are indebted to the Alpha Portland Cement Co. for this article and illustrations.

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## Concrete-Lined Canals on the Orland, California, Project

The Orland project now has 34 miles of canals lined with concrete. The total length of canals and laterals in the distribution-system is 138, of which it is proposed to line 108 miles. It is not considered practical or economical to line the remaining 30 miles for various reasons, one of the principal being that in certain places, damage is likely to result from storm-water, making the cost of maintaining the lining unusually high.

The yearly cost of maintaining the unlined ditches is $123 per mile, and of the lined ditches $10 per mile. Seepage and evaporation losses in distributing the water over the project in unlined ditches amount to 30 per cent of the total water turned into the canal-headgates, as against 3 per cent in the lined ditches. The amount of storage water reaching canal-headgates from East park dam is estimated at 40,000 acre-feet. Of this amount 12,000 acre-feet is lost in unlined ditches before it reached the land. With the proposed lining the loss will be reduced to 4,000 acre-feet, effecting a saving of 8,000 acre-feet per year.

## Good Concrete

There is an old adage often quoted that a "chain is no stronger than its weakest link," so also is concrete no stronger than the aggregate of which it is composed. From weak aggregate, frail concrete results; if the particles are of a shaly nature, the concrete will not be so strong as though all the particles were of maximum hardness.

In considering the different concrete aggregates, the important point is cleanliness; if the exposed surfaces are coated with a film of any kind, the cement cannot form a bond and poor concrete results.

## A Concrete Mixer That Performs Its Work Accurately and Upon Economical Basis

That the problem of proper and accurate proportioning of aggregates in the making of concrete has been solved by the Kent Concrete Mixer is the claim being put forth by the Kent Machine Company, of Kent, Ohio, manufacturers of the machine.

This concern is one of the pioneers of the concrete mixer industry. They have been manufacturing mixers for the last twelve years and have sold their machines throughout the United States and many foreign countries. The Kent mixing method is the pug mill continuous type. The Kent proportioning mechanism is known as the "struck" proportioning device. A given amount of aggregate falls, by gravity, through the hopper and is "struck off" by the sliding feed plate under the hoppers. This device, so the manufacturers say, attains the same degree of precision as the practice of loading a wheelbarrow level full and striking off the top with a rod or yard-stick.

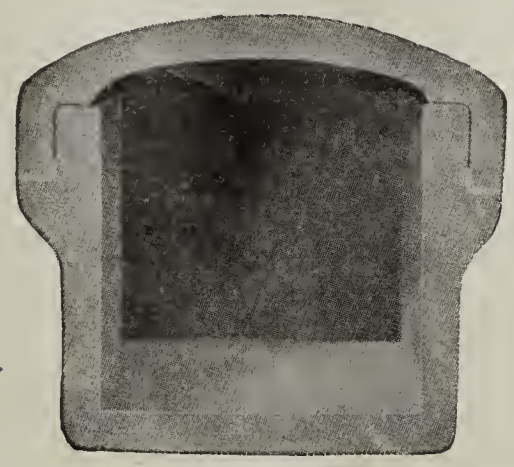
**View of concrete product plant equipped with a Kent proportioning continuous mixer. Three Kent mixers are being used in the O. C. Barbor Concrete Co's plant at Barberton, O., which is the largest and most modern up-to-date concrete products plant in the world**

The Kent Machine Company manufactures a stationary type continuous mixer especially designed for concrete block, tile and fancy mold factories, also a pug-mill type mortar mixer and a portable concrete mixer for general contract work. For the products industry the company has prepared a number of new advertising pamphlets which will be mailed on request to the factory.

## Automatically Sealing Burial Vault

A great amount of enthusiasm has been created among undertakers and people in general by the invention of an absolutely waterproof, two-piece concrete burial vault which seals automatically. Besides being perfectly waterproof, it is not excessively heavy, is a model of neatness and design, and undertakers everywhere immediately recognize its superiority because it fills every requirement.

Wooden vaults soon decay; stone or brick vaults cannot be made waterproof, and in most cases serve only the purpose of supporting the earth; steel vaults are soon destroyed by rust; concrete vaults which necessitate the use of cement to seal the joint between the lid and the body of the vault can hardly be made absolutely waterproof because of the impracticability of uniting pieces of dry concrete under the usual conditions at a cemetery. Yet, even with this uncertainty, it has been recognized that concrete is the most durable and at the same time the most practical material from which to construct burial vaults.



**Section of Automatic Sealing Vault**

The accompanying sectional view of this perfected burial vault shows how the lid extends down over the sides, thus prohibiting any possibility of water entering at the joint on account of the pressure of the air contained in the vault. This is a well-known scientific fact, and can be easily demonstrated by inverting a larger tumbler over a smaller, and, keeping the bottom of the smaller tumbler turned downward. Immerse in water. It will be seen by this simple test that water will not enter either tumbler.

The illustration also shows a small amount of cement placed on the ledge of the vault. It is not the purpose of this cement to make the vault waterproof, but sanitary, by hermetically sealing it so as to retain poisonous gases or effluvia laden with germs of contagious disease.

This invention was perfected and patented by the Automatic Sealing Vault Co., 216 East River street, Peru, Indiana, and should be thoroughly investigated by every vault manufacturer or any one expecting to enter the concrete vault business. Winter doesn't stop the sealing vault business. There is a constant demand the year round. A demand that you can supply with just one set of steel molds. The profits on each vault are from fifteen to twenty-four dollars. You can develop this as a side line or devote all your time to it.

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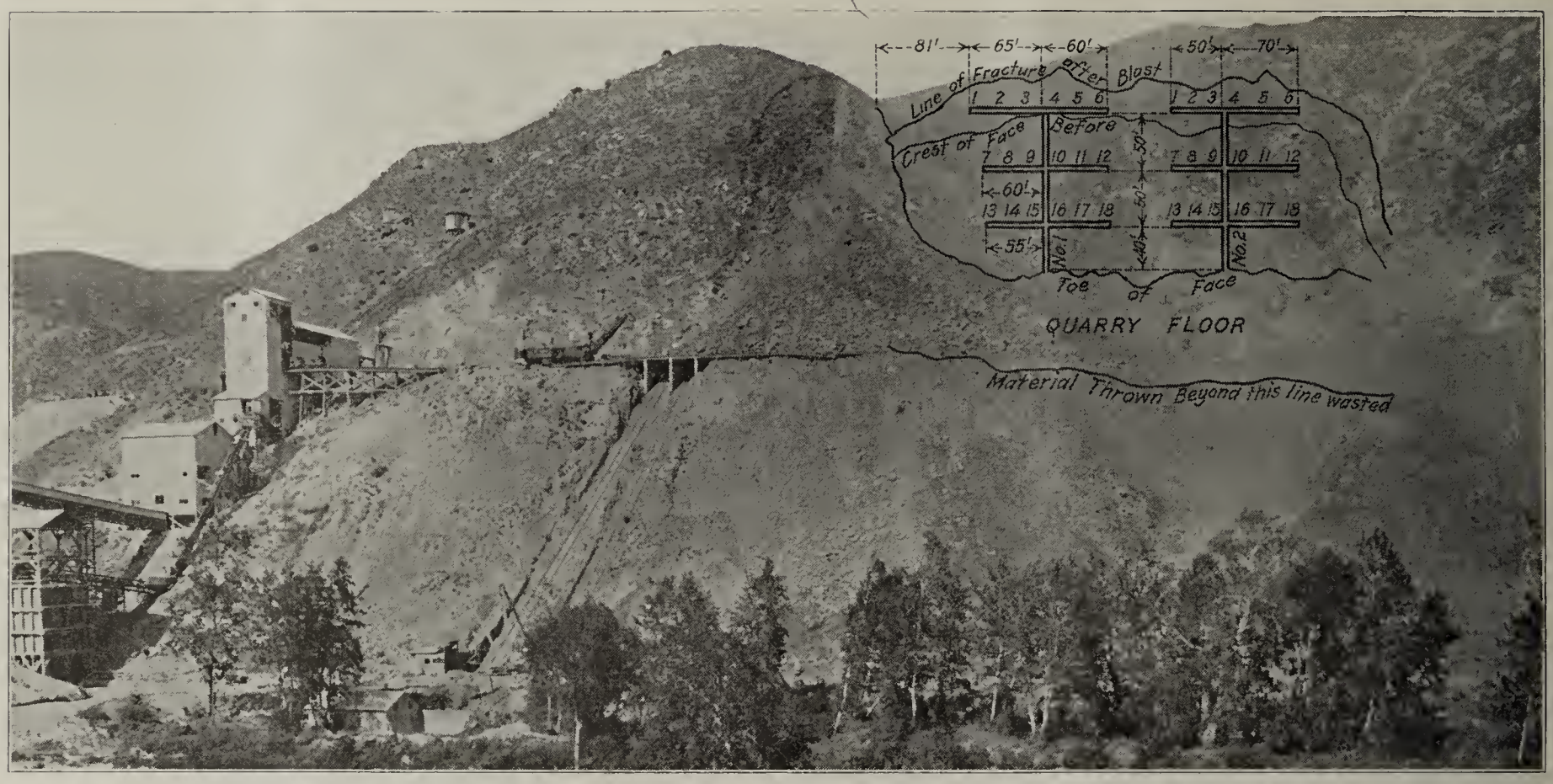
## Potash from Cement Dust

The National Portland Cement Co. at Durham, Ontario, is said to be now turning out as a by-product from the feldspar 12 to 16 tons of potash daily. Feldspar rock is added to the limestone as a raw material for cement, and a process has been evolved for collecting the potash.




No rock was lost over the embankment due to special methods of loading and firing

# *Large Blast Accurately Places 897,000 Tons of Rock*

## Proportioning a 48-ton Explosive Charge to Shatter Quarry Face Deeply without Loss of Material at Corona, Calif.

The Temescal Rock Co., of Corona, Cal., in a single blast recently broke up 897,000 tons of rock for its crushing plant without losing any of the shattered material over the edge of the 100-ft. bench that serves as the quarry floor. This was accomplished by a system of tunnels so driven that charges of quick-acting explosive would throw out the toe of the quarry face before the force of the remainder of the 48-ton charge was developed. Thus a barrier was formed which served to retain the major portion of the shattered material.

The rock from this quarry is crushed for use in concrete and is an altered rhyolite of eruptive origin, very dense and hard. The formation was solid, the strata inclining into the quarry face at about 16°. Tests of quarry specimens showed a weight of 167 lb. per cu. ft. and tensile and compressive strengths 2,245 and 39,500 lb. per sq. in. respectively.

### Location of Charges

The duplicate tunnel systems were driven at the quarry-floor level, in each of which 18 explosive charges were placed. The tunnels were 3x3½ ft. in section and all powder pockets were of such size as to allow 1⅝ cu. ft. of space for each 100 lb. of powder in the charge. The tunnels were driven 140 ft. into the quarry face, and the charges were placed in drifts at right angles to the tunnels, as shown in the accompanying sketch. In the first, or outer, drifts the powder pockets were sunk 4 ft. below the quarry-floor level. In the second drifts the pockets were 2 ft. below the quarry floor, and in the third or last drifts the pockets were at quarry-floor grade.

The quantity and the grade of the several charges are given in the following table. Note that charges 13 to 18 consisted of the quick-acting explosive calculaated to move the toe of the slope face first. The 60% powder is simply the priming charge. Cordeau-Bickford instantaneous detonating fuse was the detonator used; it was fired by a single No. 8 cap. Cyclone drilling machines were used for drilling the blast holes.

QUANTITY AND GRADE OF BLASTING CHARGES

| | Tunnel No. 1 | | | Tunnel No. 2. | | |
|---|---|---|---|---|---|---|
| | Powder Charges | | | | | |
| Load No. | Grade and Quantity | | | Grade and Quantity | | |
| | 60% | 40% | 25% | 60% | 40% | 25% |
| 1 | 50 | ... | 4,150 | 50 | ... | 4,300 |
| 2 | 50 | ... | 3,650 | 50 | ... | 3,850 |
| 3 | 50 | ... | 3,800 | 50 | ... | 3,900 |
| 4 | 50 | ... | 4,450 | 50 | ... | 3,550 |
| 5 | 50 | ... | 4,050 | 50 | ... | 3,300 |
| 6 | 50 | ... | 4,750 | 50 | ... | 4,150 |
| 7 | 50 | ... | 3,250 | 50 | ... | 3,100 |
| 8 | 50 | ... | 3,100 | 50 | ... | 2,900 |
| 9 | 50 | ... | 3,200 | 50 | ... | 2,950 |
| 10 | 50 | ... | 2,950 | 50 | ... | 2,700 |
| 11 | 50 | ... | 3,100 | 50 | ... | 2,800 |
| 12 | 50 | ... | 3,350 | 50 | ... | 3,200 |
| 13 | 50 | 550 | .... | 50 | 900 | .... |
| 14 | 50 | 850 | .... | 50 | 850 | .... |
| 15 | 50 | 800 | .... | 50 | 800 | .... |
| 16 | 50 | 800 | .... | 50 | 750 | .... |
| 17 | 50 | 850 | .... | 50 | 700 | .... |
| 18 | 50 | 950 | .... | 50 | 850 | .... |
| Total | 900 | 4,800 | 43,800 | 900 | 4,850 | 40,700 |
| Grand Total | | 95,950 lbs. | | | | |

In firing these charges the detonator known as Bickford cordeau, which is chiefly trinitrotoluol, incased in a ⅜-in. tube, was used. A single No. 8 cap detonated all the charges simultaneously. This cap was attached to one end of the line of cordeau, which was strung through the tunnels, each branch terminating in a 20-ft. coil embedded in the charge.

### Cost 2¼ Cents Per Ton

Measurements of the slope after the blast led to the estimate that the 897,000 tons of rock had been shattered by the blast. So effective was the work of the

powder that only a slight amount of secondary shooting would be required to prepare the rock for the crusher—probably about one ton of 40% powder for bulldozing each 100,000 tons of rock.

The cost of driving 1,000 ft. of tunnel at $5 per foot was $5,000. The cost of the explosive was $14,808, to which was added $96.72 for 1,860 ft. of cordeau. Loading, tamping and incidental expenses amounted to $603, so that the total cost of the blast was $20,508, or about 2½ cents per ton. The tunnel work and the placing of the charges was done under the direction of J. C. Costello (who supplied the foregoing information) and J. C. Cushing, engineers for the California Trojan Powder Company.

# *Safeguarding Quarries*

By Mr. A. G. Croll, General Superintendent, The Atlas Portland Cement Co., New York, N. Y.

I have been asked by the Program Committee of the National Safety Council to make a few remarks regarding the safeguarding of quarries.

The remarks which I will make will have reference to the safeguarding as practiced at the plants of our company, the Atlas Portland Cement Company.

We consider the quarries one of the most hazardous departments of our industry and consequently have taken special precautions and adopted special rules to prevent accidents. These rules and regulations relate to the different operations in the quarry, the handling of dynamite, the storage of same, the loading and shooting of holes, the protection of employees from slides of rock, as well as the safeguarding of such machinery as is in use.

The care of dynamite begins upon receipt of the car at the plant. When the car is received, the seals are checked and compared with the shipping notice. After this the dynamite is stored in concrete magazines and kept under lock and key until used. The same man is always in charge of the magazine, and no strangers are allowed anywhere near it. A record is kept of the dynamite taken from the magazine and this is compared with the blasting foreman's record of the dynamite used in order to check the amounts; any dynamite drawn from the magazine and not used by the blasters is returned. We have our magazines, as well as the thaw houses, surrounded by earth embankments. The men unloading cars or working in the magazines are required to at all times wear rubber shoes, which are provided for this purpose.

Dynamite is never stored or left in the same building with caps, exploders, or fuse. In cold weather when it is necessary to thaw dynamite it is thawed in separate houses built for that purpose, and the employees are not allowed to thaw it in any other way. The thawing houses are kept at a temperature below 100° F. Our rules for opening dynamite boxes require that they be not opened in the powder magazines and that they be opened by the use of a wooden wedge and a wooden mallet which are supplied.

In transporting the dynamite from the magazine or thawing houses to the drill holes, it is required that the boxes be so packed that there can be no movement or shifting in the wagon or cart, and in no case are the employees allowed to carry caps, exploders or fuses at the same time they are handling dynamite. Smoking or the carrying of matches while handling dynamite is strictly prohibited.

In loading holes, no more men than are necessary are used in the powder gang, and the same men are used at all times for this purpose.

In preparing for a large blast, which consists of the shooting of a number of well drill holes, careful preparations are made to protect all employees. No one is allowed in the danger zone of the quarry floor. Before charging the holes they are examined to be sure that there are no loose stones or earth above that are apt to fall.

In tamping the dynamite in these deep well drill holes, nothing is used but a wooden pole. This pole is free from nails and from any iron or steel, and is kept clean and free from grit and gravel. When the pole is brought up out of the hole it is rested on a canvas pad one inch thick. The holes are tamped by pressing on the tamping pole and not by ramming. When we are through loading, all dynamite left is returned to the magazine.

In inserting exploders into cartridges, we open the paper at one end and insert a pencil shaped piece of wood, then put in the exploder, pull the paper around it and tie it with a string. This we consider very necessary to prevent misfiring.

In getting ready to fire, the lead wires are never connected with the exploders until we are ready to make the blast. In connecting the exploder wires, we see that all joints are secure and well made and insulating taps is used on the connections and bare spots. The batteries are not connected until the signal for the blast has sounded and all the men are in a place of safety.

Before any shot is fired, a signal is sounded consisting of a certain number of blasts from a whistle. The number of blasts of the whistle indicates the location in the quarry at which the shot is to be fired, these signals being known to all the quarry employees. In case the quarry is near a public road, men are sent out to notify the public.

After the blast is shot, it is required that the blasting foreman make an examination to see that all the shots have been fired and that there has been no misfire and until he gives the signal the men are not permitted to leave their places of safety.

It is the duty of the foreman to see that the pile of rock is safe at all times and that it is not undercut. This is to afford protection to the men against slide of rock.

The machinery used in connection with the quarry is guarded in the usual manner, all gears and moving parts being protected.

No strangers are allowed in the quarries and fires are guarded against particularly.

No blasting is done in our quarries except between sunrise and sunset, and at no time Sunday.

In conclusion, would say that every precaution is taken in our quarries to prevent accidents. We believe that as few men as possible should be exposed to danger in the handling of explosives and that only men thoroughly familiar with the same should be allowed to handle them. The men should be taught that dynamite or other explosives are dangerous and that they should be handled accordingly. We tell our men to handle dynamite as they would a box of eggs which they owned and did not wish to break.

We believe that the best protection the quarry employee can have is a careful, conscientious and competent quarry foreman and quarry superintendent.

# The Proposed Postage Increase on Trade Papers

The curiously illogical plea advanced by the members of Congress who proposed and jammed through the 50 to 900 per cent postage increase on newspapers and periodicals is worthy of the quaint thinking of Sancho Panza himself. The former postal rates on periodicals, they say, was a "subsidy"—low postal rates in general they regard as a "subsidy" and openly so state. It would seem all but useless to ask men with minds so befuddled what our government functions and social and economic relations really are in the light of such mental incapacity.

Low periodical postage is not a "subsidy" from the Postal Department in any other sense than is the Department of Agriculture, with its enormous benefits to the nation, a "subsidy" to farmers; the Department of Commerce, with its vast information by which wealth and trade is added to our country, a "subsidy" to merchants and manufacturers; or the Department of Labor a "subsidy" to children when it opposes child labor, or a "subsidy" to workers when it bulletins throughout the nation opportunities for employment. There are certain great national functions in any society that are so crystallized to such an extent, that they can be regarded as expressing civilization.

The history and development of the Postoffice Department clearly shows that it was established, developed and extended in response to a need of the people of this nation, and which they demanded. It was founded and established as a government function in order to assist in spreading education, the knowledge of science, information and news of current history, to impress and make easy the ways of intellectual intercourse. Postage was provided at a flat rate, irrespective of distances or the cost of transporting to greater distances, in order that American citizens in more remote sections of the country, and who needed this mental and intellectual contact with their fellow citizens, should not be left to rust owing to the penalty of postal costs. This was and is the basic principle of postal service.

But Chairman Claude Kitchin of the Ways and Means Committee thinks otherwise. So does Congressman Rainey of Illinois, and various other gentlemen of similar minds, who would place a penalty on reading in the remoter sections of the country and allow poverty to prohibit reading altogether. The "subsidy" of low postage is—to use the word in which these short-sighted political gentlemen so delight—to readers; it is a "subsidy" to homes, in order that they may develop intellectually; it is a "subsidy" to the poor man's education; it is a "subsidy" to health, morality, intelligence and high thinking; it is a "subsidy" to culture, art and literature; and, to be brief, it is a "subsidy" to the highest development of American citizenship.

# Utah Cement Plant Alterations

The Utah Portland Cement Company is making extensive alterations and improvements at its plant at Eighth, South and Fifth West streets, Salt Lake City, Utah. These, it is stated, will cost in the neighborhood of $100,000 and will include the erection of six immense concrete silos, each 60 feet high, to provide storage room for the company's product. There is also being installed a sort of sprinkling system by which it is hoped to eliminate the dust evil and at the same time make it possible to convert the dust into potash for fertilizing purposes.

# One-Course Sidewalks

To a great extent the one-course sidewalk is replacing the two-course type. As a uniform mixture is used throughout, the cost of mixing and placing is greatly reduced. As the one-course walk is made of stronger concrete, it can be made thinner than the two-course work. Where in two-course work a base of a 1:2½:5 mix, 4½ in. thick, and a finish of a 1:3 mix, 1 in. thick, is used, an equivalent walk can be made of a 1:2:3 mix, 4 in. thick.

In two-course work there is always danger of not obtaining a proper bond between the finish coat and the base. When two-course work is laid in large sections it is more liable to crack, as the ratio of expansion of a 1:2½:5 concrete is less than that of 1:3 mortar. This often causes cracks or leads to the finish coat separating from the base. In one-course work the ratio of expansion is uniform throughout slab. While this difference in expansion is not likely to cause trouble where the slab is divided into small sections by joints, there is likelihood of trouble in large areas, such as floors, where there are no expansion joints.

One-course work of a 1:2:3 mix can be satisfactorily finished with a wood float, giving a surface which is smooth yet not slippery in wet weather. Sidewalks of either one- or two-course work should not be given a steel troweled finish, as such a surface is extremely slippery and dangerous in wet weather. This also applies to barn floors and all types of pavements used by animals. A surface finished with wood float will be smooth, but presents a gritty surface that gives animals, even if shod, a good footing. It is rarely necessary on inclines to make corrugations for footholds if the surface is wood floated.

For corresponding work a one-course walk is much cheaper in material than a two-course type, as shown in the table below:

| | Sidewalk 100'x5'. | | | | |
|---|---|---|---|---|---|
| | One Course. | | Two Course. | | |
| | 1:2:3 Mix, 4" Thick. | | 1:2½:5 Base, 4½" Thick, Mortar Coat, 1:3 Mix. | | |
| | | | | Mortar | |
| | Slab. | Total. | Base. | Coat. | Total. |
| Cement | 11.20 bbls. | 11.20 bbls. | 8.68 bbls. | 3.81 bbls. | 12.49 bbls. |
| Sand | 3.0 c.y. | 3.0 c.y. | 3.36 c.y. | 1.54 c.y. | 4.9 c.y. |
| Stone | 4.7 c.y. | 4.7 c.y. | 6.7 c.y. | | 6.7 c.y. |

# New Book on Hydrated Lime

The Hydrated Lime Bureau, Oliver Building, Pittsburg, Pa., has just issued a new booklet concerning "Hydrated Lime" by E. W. Lazell, Ph. D., which they will gladly send to any of our readers. It is clothbound, illustrated and contains 95 pages. This is a manual for the architect, engineer, contractor and builder. The frontispiece is a picture of the well-known sphinx and pyramids. Anything that starts out with a picture of the sphinx is bound to be interesting. This book is no exception. It is also valuable. What do you know about Dolomitic lime? What is a Kritzer hydrator? What is the Sauman process? What is hydrated lime itself; how does it render concrete waterproof; how does it lubricate concrete so that it will slip easily? The book tells. The art of using lime is one of the very oldest connected with the building trade. The Greeks and Romans brought it to great perfection. Possibly the sphinx was hydrated, hence the frontispiece. At any rate, though lime is an old story, there is a new angle to the story now that lime is used in connection with concrete. The book will post you.

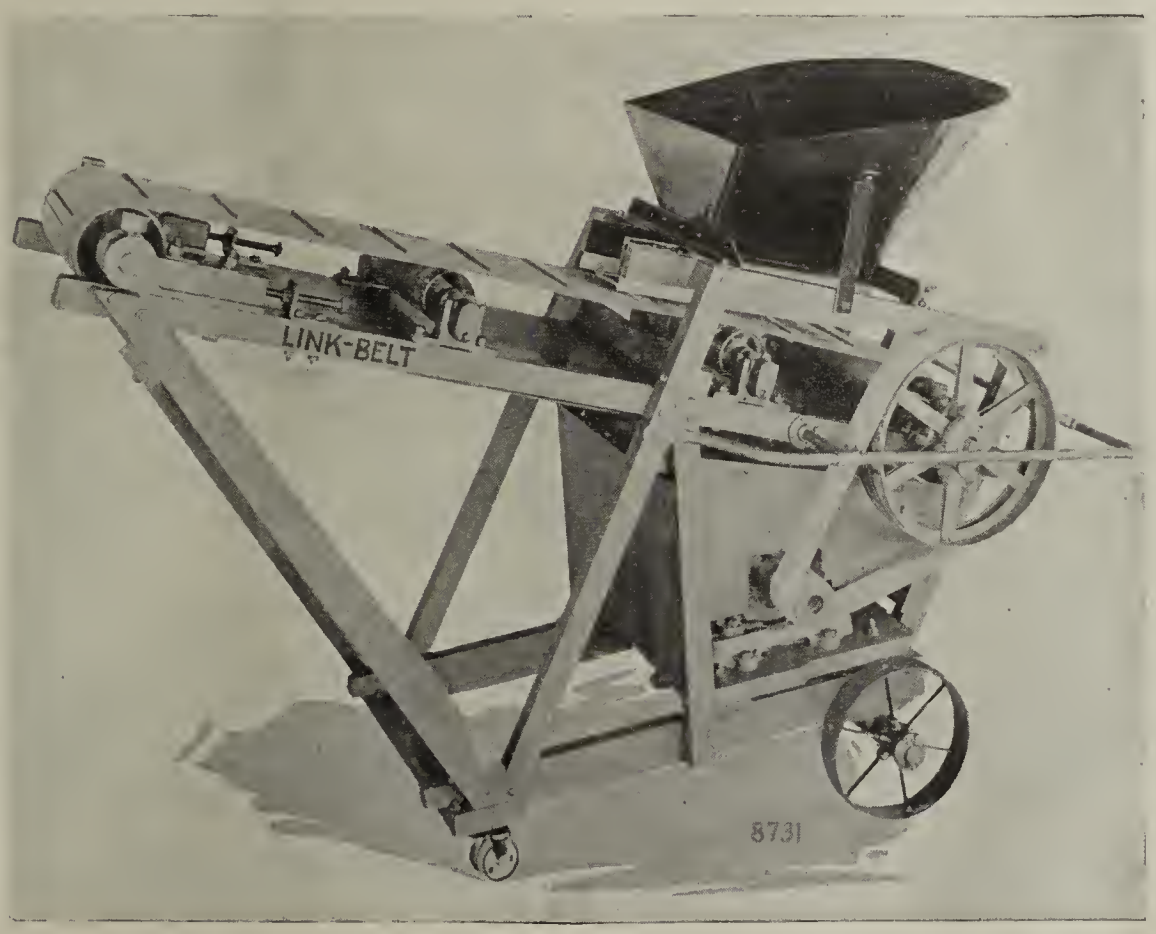
## Gravel and Crushed Stone Car Loader

The Link-Belt Company of Nicetown, Philadelphia, Pa., has recently put on the market a low priced machine for loading all kinds of material into box cars.

It is called the Link-Belt BX Loader; is portable, driven by motor or gas engine, and handles the material delivered to it through the steel hopper, on a flat belt.

On a recent test it loaded 80 box cars in six days with but two men. Its capacity is 80 to 100 tons per hour.

When we consider that it will take three men at least two and one-half hours to load one car, and compare this with the speed at which the Link-Belt BX Loader will do the same work (two men and the Link-Belt Loader can load one box car in 35 minutes), an idea can be obtained as to the usefulness of this device. The price is $600.00 complete with motor or gas engine f. o. b. Nicetown, Philadelphia, Pa.




## Road Building and the Car Shortage

Road building as an economic factor in the life of a nation in time of peace becomes all the more vitally important in time of war. We have as a nation begun during the last few years to realize that our impassably bad roads are a serious menace to the prosperity of the country in peace and would be a real menace in case of war, and the building of roads even as a military necessity has been urgently argued for some years. The war upon which we have entered makes all the more important that at the present time road building as a military policy should be vigorously prosecuted, and road-building materials should be one of the favored freights, just as coal and iron and steel now are.

There has been a suggestion that road building should be lessened in order to permit the labor engaged in this work to be turned into farming, or into other employments. This is a mistake. Road building is vitally important. Under the strain that is being put upon the railroads of the country their facilities for handling traffic are wholly inadequate to the needs of the times, and many passenger trains must be discontinued for the purpose of using passenger locomotives for freight traffic. Of necessity this will increase the demand for transportation of people and freight by automobiles and motor trucks. There is no other way in which the shortage of railroad facilities can be so quickly and largely supplemented as through the automobile and the motor truck on good roads. Water transportation will be developed, but this is a matter of slower growth, as it will take a longer time to provide the boats and make some much needed river and terminal improvements to enable water transportation to take the place of railroads.

In the building of good roads, however, every mile of completed road benefits the farmer, increases his ability to expand his agricultural activities, increases the possibility of profit in farming, makes country life more attractive to the laborer and enables the farmer to distribute his products to the consumer more quickly and at a lower selling expense.

This situation will grow more and more acute; farming will be made more and more undesirable, and the inability to transport foodstuffs and of business people to travel over the country will be increased unless the building of good roads goes on steadily and aggressively.

## Limestone Road Materials of Wisconsin

The State Printing Office, Madison, Wis., has recently issued Bulletin 34, entitled "Limestone Road Materials of Wisconsin," 7x10 inches, 136 pages, illustrated, and contains tables and diagrams. It is a publication intended to aid in conserving highway expenditures for stone, which, delivered on the road, usually represents two-thirds or more of the total cost of the road. The report contains chapters on the general characteristics of Wisconsin road materials and descriptions of tests on hardness, toughness, per cent of wear, specific gravity and weight per cubic foot, and absorption.

## Wagon Loader a Big Time and Labor Saver

We are glad to reproduce herewith a picture of a bit of labor-saving machinery that is proving its value daily in the yard of McQuade & Bannigan, the successful firm of building supply dealers at Utica, N. Y. Mr. Bannigan is the well known president of the New York State Builders' Supply Association, and his personal testimony is worth the attention of every dealer in gravel, sand and crushed stone.

"When we installed motor trucks for delivery we were up against the proposition of the delay caused by loading the trucks by hand and the old theory that figures won't lie was dissipated in the case of loading trucks. If one man could shovel a ton of stone in one hour, two could shovel it in half an hour, four in a quarter of an hour and six in ten minutes and ten in six minutes, but you couldn't get the men around the truck to load it. We were therefore losing valuable time in loading, as it took from twenty minutes to half an hour to put on a load.

"In looking around for something to overcome this expense and delay, we hit upon the loading machine, which we purchased of the Jeffrey Mfg. Co., 914 North

Loading and screening a yard of sand per minute at sand deposit of Lyman Huntley, Syracuse, N. Y., using Jeffrey Self-Propelling Loader

Fourth street, Columbus, O. We have loaded as high as two hundred tons of stone in a day with the machine; this was not the capacity of the machine, but the capacity of our output. With the machine we can load a three-ton truck in between four and five minutes, where by hand it would take in the neighborhood of a half hour.

"With the machine we use three men, by hand we would have five or six. The machine running steadily for ten hours will consume about one and one-half gallons of gasoline and a pint of oil. It does not need a mathematician to figure out the great saving in the use of the machine for loading, either in using trucks or wagons. Before the installation of the machine in our yard, in using wagons for hauling stone, we used extra wagons and had the wagons loaded so that all the drivers had to do was change from one wagon to another and in this way we overcome the delay in the teams, but this result could not be accomplished with the motor trucks.

"You ask us if the machine has been satisfactory. We will tell you (have told several dealers who have written us regarding the machine) that if we could not replace it, we would not sell it for ten thousand dollars.

"Not the least of the advantages of this machine seems to be the simplicity of operation. In three years' time the cost of repairs has not totaled $20."

## A Real Light-Running Concrete Cart

The modern, latest-improved type of concrete cart has features that recommend it very highly to all contractors who are interested in lowering the costs and increasing the profits on concrete work.

The name of this cart—Boss Hyatt Bearing Concrete Cart—in part describes it. It is equipped with these famous bearings and is offered by the manufacturers as the lightest-running and strongest cart ever built. With the Hyatt Roller Bearings and 36-inch high wheels it runs about 25% easier than the ordinary cart. It is perfectly balanced—does not require any expenditure of strength to keep it from tipping. All the operator has to do is to shove it ahead.

The Boss Concrete Cart is built to "stand up" for the heaviest, hardest service. It combines serviceable strength with light weight and the easy running features to make a cart that will meet all requirements. It's made of steel throughout—body of No. 14 gauge steel with No. 10 gauge reinforcements, axle 1¼-inch cold rolled steel, wheels of steel, 36-inch high and with 2½-inch tires. Total weight, only 240 pounds.

This cart has a capacity of 6½ feet of wet material and appears to be strong enough to handle twice that

Handling crushed stone at the yards of McQuaide & Bannigan, Utica, N. Y., with a Jeffrey Self-Propelling Loader

amount. There isn't a weak spot about it—nothing that can wear out quickly or cause any delay when in service. With ordinary care it should outlast the old-fashioned cart, two to one. It's labor-saving qualities cannot be questioned and it is being enthusiastically endorsed wherever used.

The manufacturers of the Boss Cart—American Cement Machine Co., Keokuk, Iowa—will gladly furnish full information about their Hyatt equipped cart. Write them if you are interested in getting the right cart for your service.

## Rupert Becomes Vice President of Nuttall Company

Milton Rupert was recently elected vice president and assistant treasurer of the R. D. Nuttall Company, of Pittsburgh, Pa., manufacturers of gears, pinions and trolleys.

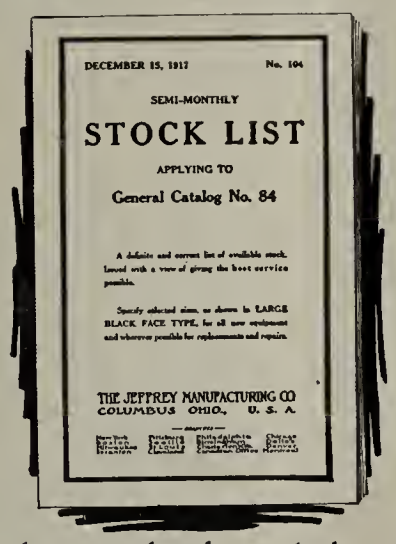
Mr. Rupert has been with the Nuttall company since March 4, 1893, holding various positions. In 1903 he was appointed head of the general offices, being directly in touch with all office matters and also manufacturing operations. During the latter part of this period Mr. Rupert was assistant to the president and general manager.

In his new position Mr. Rupert will have charge of sales and manufacturing activities.

## Stock List of Elevating and Power Transmission Machinery

In order to give their customers the best possible service, especially during such times as these, the Jeffrey Manufacturing Company, 914 North Fourth street, Columbus, Ohio, have prepared a stock list showing material actually on hand. This is somewhat of an innovation in so far as it applies to manufacturers of elevating, conveying and power transmission machinery.

The stock list is issued semi-monthly and contains a complete list of all available stock covering chains and attachments for elevators and conveyors, malleable




iron and steel elevator buckets, belt conveyors, spiral conveyors and fittings, take-ups, bearings, hangers, pulleys, etc., together with approximate shipping dates for various materials.

The advantage to the customer is readily appreciated, as it enables the trade to order materials which are in stock, thereby getting prompt shipment and the further advantage of eliminating extra cost which is necessary when special equipment is produced.

The stock list will be sent regularly to all who desire it upon request to any of Jeffrey's branch offices, or to the home office at Columbus, Ohio, 914 North Fourth street.

## Cement Co. Has Many in Ranks

The year 1917 brought about many changes in Leeds, Ala.

Before leaving for Camp Lee, Letersburg, Va., Major F. H. Lewis finished up and put in operation the fifth unit of the Standard Portland Cement plant. The plant is run by hydro-electric power, and it is probable that the gas from the Aldrich dome will be piped up to the plant to burn the clinker, instead of powdered coal, which is now used.

Following is a list of the employes of the Standard Company now either in training or in the service of the United States army or navy:

White—Major Frederick H. Lewis, Cobb Ramey, Gordon W. Whitmire, Mansell Garrett, Jessie Dorough, J. Ernest Garrett, James O. Rowan, Charles Stone, Walter Rowan, Theron Runyan, W. C. Wayatt, Oscar Joiner (died at Camp Wheeler, Macon, Ga.), Joseph Dorough (honorable discharge account of health), Capt. Charles F. Lewis, Herchal Pool, Julius Bailey, Hugh Caffey, Bert McLaughlin, Newman Ataway, Floyd Ataway, J. B. Elliott, Jim Nickols, Rich Obarr, Dave Foster, Lewis DeShazo, Rossers Farley, W. L. Dimon, Robert Abercrombie, Jerry Morgan, J. McKay, and Misses Aeta and Maie Rowan, trained nurses.

Colored—G. B. Holley, George Wright, Golden Hill, Jeff Harris, Adie Goggins, Lankston Pearson, Will Mangle.

## Cement Mill News

Frank D. Walters, formerly superintendent of the Colorado Portland Cement Company, is now located at Sierras Bayas, Argentine Republic, S. A., care of the Compania Argentina de Cemento Portland.

Boyd H. Walter, chief chemist, Lehigh Portland cement plant, Mason City, Iowa, has enlisted in the Signal Corps, U. S. Army, and is now located at Camp Dodge, Iowa.

Edward McKim Hagar, president of the American Interntaional Steel Corporation, formerly president of the Universal Portland Cement Company, Chicago, died on January 20th at his residence in New York. Mr. Hagar was born in Canajoharie, N. Y., on August 13, 1846. He was educated in the public schools of Massachusetts, which he left to become messenger in the Boston banking house of Kidder, Peabody & Co. He remained there for sixteen years, rising to the position of general manager. He came to Chicago in 1885 and for ten years was manager of the foreign loan department of the Union National Bank. He then became vice president and treasurer of the Marion brick works and began his career as a captain of industry. In 1905 he was secretary and treasurer of the Wells Construction Company and of the Illinois & Southwestern Railway Company. Later he was elected president of the Universal Portland Cement Company. His next position was that of president of the American International Steel Corporation.

## Elected President A. S. of Civil Engineers

Word has just been received from New York of the election of Professor A. N. Talbot of the University of Illinois to the presidency of the American Society of Civil Engineers, an honor which is probably the highest within the power of the engineering profession to confer upon one of its members.

Professor Talbot is a graduate of the University of Illinois, class of 1881, and has been a member of the faculty of that institution since 1884. Since 1890 he has been head of the Department of Municipal and Sanitary Engineering and in charge of theoretical and applied mechanics and has directed important investigational work in engineering materials, reinforced concrete, railroad track, hydraulics, waterworks and sewerage, the results of which have made the University of Illinois famous throughout the world. In reinforced concrete, for instance, the University of Illinois, under the direction of Professor Talbot, has accomplished more in the application of theory to practice and in practical development than all other similar institutions in the United States.

## Coosa Cement Gets Blanchard

H. M. Blanchard is now in charge of sales of Coosa Portland cement, having been engaged in that capacity by W. S. Lovell, of Birmingham, trustee for the Coosa Portland Cement Company.

The extensive and costly improvements on the plant at Ragland, Alabama, were made during the past year. The company's financial condition was such that it was thought advisable to have its affairs administered by a trustee, and W. S. Lovell, a well-known and thoroughly capable business man of Birmingham, was appointed trustee and is now in charge. The selling arrangement with the Kirkpatrick Sand & Cement Co., Birmingham, Alabama, was terminated and the trustee is handling sales direct, with Mr. Blanchard in charge as sales manager.

## Annual Meeting of the Northwestern Cement Co.

Gratifying business was reported to the stockholders of the Northwestern States Portland Cement Company by C. H. McNider, president and general manager, at the annual meeting of the company, recently held in Mason City, Iowa, in spite of the war and everything else which might have tended to make business less than normal.

Though the year was a successful and satisfactory one, it was determined to be best to forego any large improvements at the plant until conditions are more settled, but the installation of a system for the precipitation of the cement dust and saving of waste heat will be the next major betterments to be undertaken. These will come whenever conditions seem to warrant them.

The stockholders re-elected the old board of directors, and the directors in turn re-elected the old officers. All directors except F. E. Keeler and Hanford McNider were present. In addition to the directors about forty stockholders were present, the number being smaller than usual, largely because war service duties kept the men at home.

The officers and directors are as follows:

C. H. McNider, president.
F. E. Keeler, treasurer.
Hanford McNider.
F. G. Ray, secretary.
A. F. Frudden, vice-president.
W. O. Winston.
W. H. L. McCourtie.
C. H. Wagner.
M. T. Gunderson.
T. H. Dinsmore.

## Government Concrete Tile Test Report

The United States Bureau of Standards has issued a booklet entitled, "Durability of Cement Drain Tile and Concrete in Alkali Soils." The subject matter covers the results of three years' tests in various parts of the country where alkaline soils predominate.

To summarize: "No definite conclusions can yet be drawn as to the ultimate resistance of concrete to the action of alkali in the soils and waters in the projects under observation. However, if cement drain tile are to be used in alkali soils or waters containing 0.1 per cent or more of alkaline salts they should be made of good quality aggregate in proportions of not less than one part Portland cement to three parts aggregate. The consistency should preferably be "quaky," which has proved the most resistant of all mixtures used. This is wetter than that generally used in commercial tile plants and will probably require the retention of the tile in the molds for several hours, unless some means are found to hasten the hardening of the cement."

This booklet gives a complete report of all investigations and tests and can be had for 35 cents from the Superintendent of Documents, Government Printing Office, Washington, D. C. If you market your tile in an alkali country, the booklet will be valuable to you.

## Guy E. Tripp Made Ordnance Executive

Guy E. Tripp of New York, heretofore chairman of the Westinghouse Electric & Manufacturing Company, has been appointed by the War Department as chief of the production division of the Ordnance Department, intrusted with the task of supervising and stimulating the production of all ordnance supplies.

The appointment of Mr. Tripp is one of the important steps in the reorganization of the Ordnance Bureau, announced recently by its chief, General Crozier.

Mr. Tripp, who has been given a commission as colonel, was selected because of his experience in the manufacture of munitions of all kinds, the Westinghouse company having obtained large contracts from the British and Russian governments immediately on the outbreak of the European war. Mr. Tripp is credited with bringing to the department the highest obtainable type of experience and ability to insure speedy and careful production of munitions. The Board of Directors of the Westinghouse Company has given him a leave of absence for the duration of the war.

## Roads on Business Basis

Road building in the United States is now getting down to a business basis. Generalities are hardening into concrete facts—something tangible upon which to base the cost of the modern road and the amount the construction of such a road will save. Sufficient evidence also has been accumulated to prove beyond question that the old type of road will not meet new traffic conditions.

In transforming old roads into new, two stages of engineering have developed. The first is what might be termed the mental engineering stage, or the work of bringing together and concentrating all previously conflicting forces or ideas of the state, county, or community upon the one specific enterprise—the building of roads that will last.

Shifting the public mind around to a point where the economy of building roads for permanence is thoroughly understood, is now being done by first ascertaining the amount of money that has been sunk during a given period of years to maintain old types of road in passable condition. Against this amount is set the first cost and upkeep of a concrete road, covering a like period. The net result of this comparison shows that the permanent road costs no more than the old road covering an equal number of years, with this difference: The permanent road is still in good condition and usable every day in the year after it has been paid for, while excessive repair expenditures must continue, in the future as in the past, on the old type roads. These points are familiar to our readers, but they will bear repeating.

**FOR SALE**

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Pittsburgh, Pa.

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## As a Patriotic Duty

Keep the roads in good shape—new culverts, better ditching—because maximum food production requires good roads. Promote drainage projects, large and small. We need more land under cultivation. Keep up normal improvements wherever possible—the well being of the nation demands it. BUT, as a patriotic duty, use concrete and SAVE iron and steel. Therefore, inform yourself fully of the utility and economy of

## "NORTHWESTERN" Tile and Culvert Forms

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### Standard and Special Sizes

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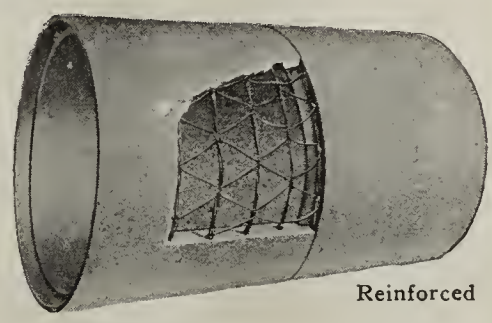
Convenient, durable. Greater **SAVING**—greater **SERVICE.**

Full instructions for making "NORTHWESTERN" Concrete Tile in Bulletin No. 29.



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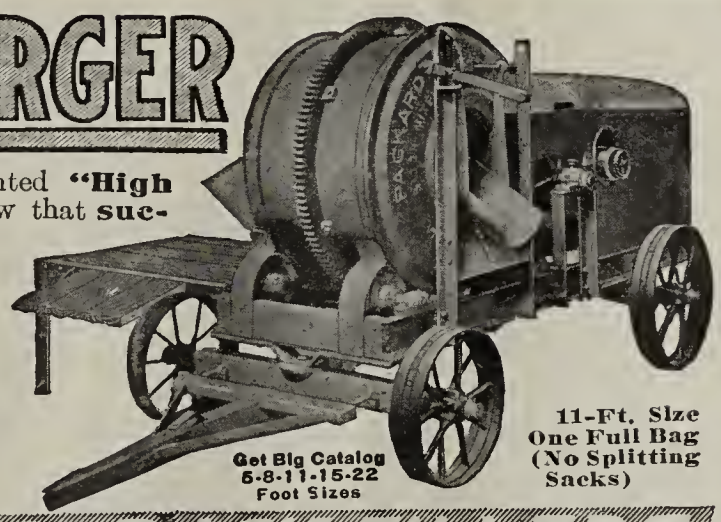
Get our astonishingly low prices on these sturdy, built-of-steel mixers—also our Terms. 6 and 11-ft. sizes—also with Loaders. Quick deliveries from stock carried in all large cities. Write nearest office

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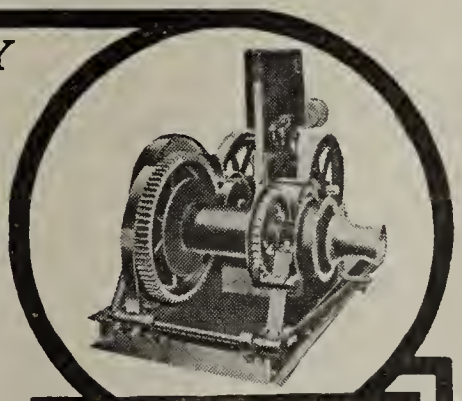
## Contractors' Hoists

Gasoline—Kerosene or Electric Power—reliable as steam. Absolutely dependable. $5 to $10 a day cheaper to operate. Three sizes—6, 8, 10 H.P. Three speeds—100, 150, 200 ft. Rope Travel. Hyatt Roller Bearings. Prompt Deliveries. Write, wire or 'phone nearest branch office.



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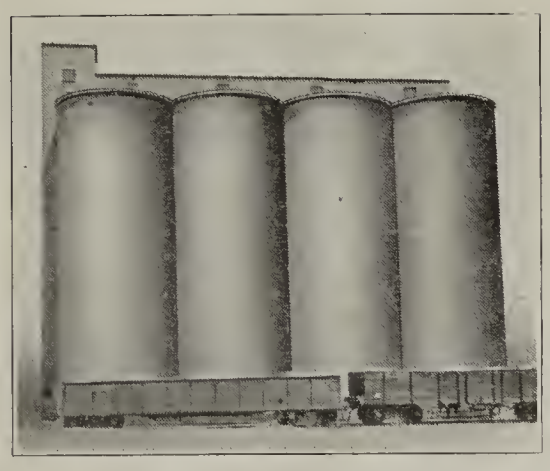


## Eleven Bin Stock House

Erected for the

**Ft. Dodge Portland Cement Co.**

GILMORE CITY, IOWA

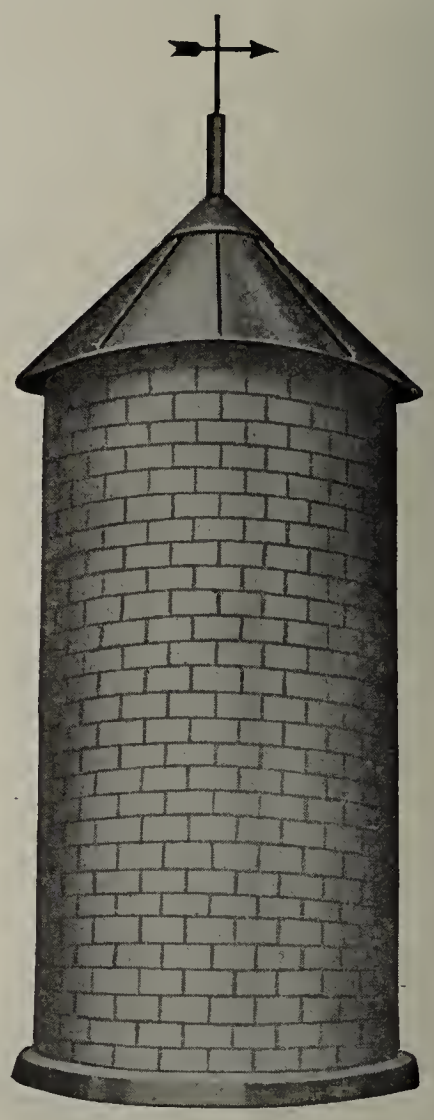
Let HOAG Build your Stock House

# D. F. HOAG & CO.

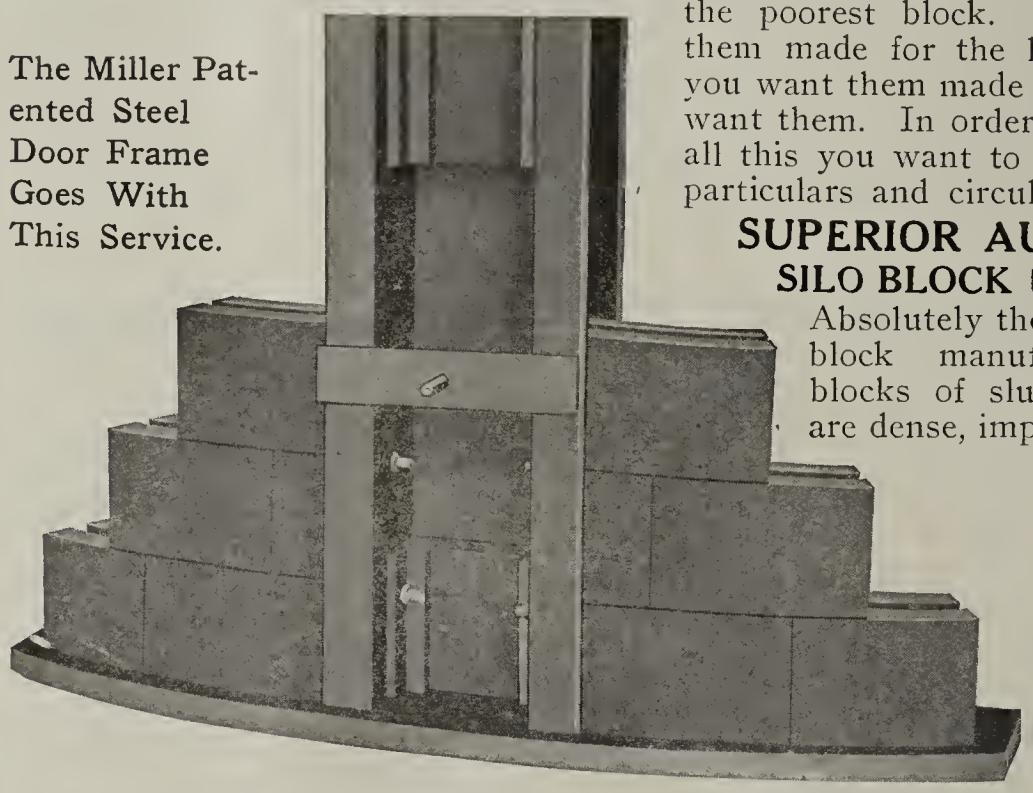
**Engineers and Builders**

**202-4 Corn Exchange - - MINNEAPOLIS**

# Machine Made Silos



F YOU are in the silo business or intend to get into it, you want to make a silo block that is absolutely the best on the market. You don't want one tamped little and another tamped a lot; you want the same amount of material in each block that goes into the silo you sell. The whole silo is only as good as the poorest block. Then you want them made for the least money, and you want them made fast when you do want them. In order to be able to do all this you want to write for further particulars and circular regarding our



The Miller Patented Steel Door Frame Goes With This Service.

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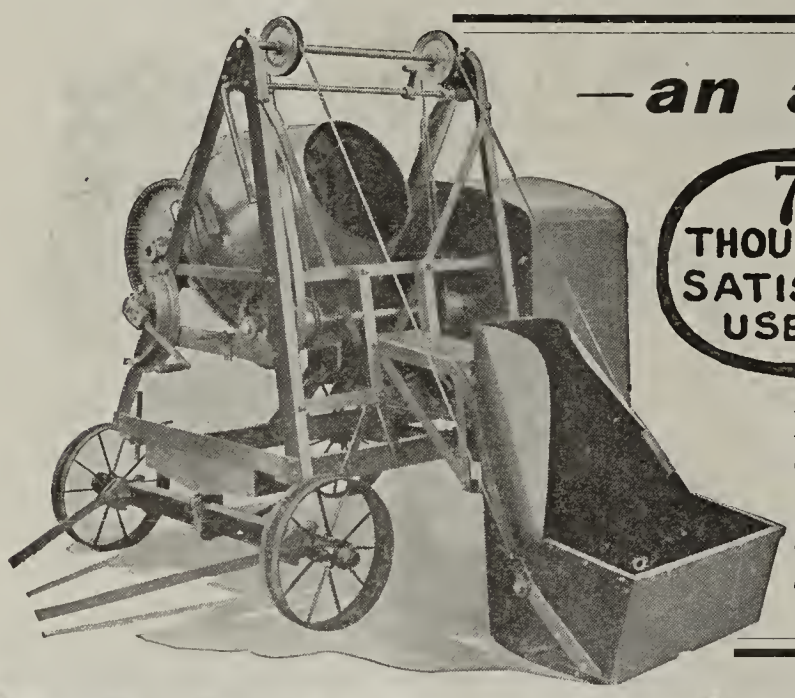
Absolutely the last word in silo block manufacture. Makes blocks of slush concrete that are dense, impervious, hard and strong. Three men can make enough blocks for a 12x30 silo in one day. Machines leased, not sold. Write for particulars and territory.

**Superior Concrete Machine Co.**

**North Judson, Indiana**



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It shows a substantial profit on a little sidewalk job as well as on big construction work. it will cost you three cents an hour to run the Jaeger and you get a mix a minute.

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## CIRCULAR MONOLITHIC CONCRETE CONSTRUCTION

WHY NOT get into the field of concrete construction where competition does not bother and where profits are big?

BUILD grain tanks, coal pockets, water towers, silos, silo-tanks. A postal will bring you valuable information. Start toward a bigger business today.

**POLK GENUNG POLK COMPANY**

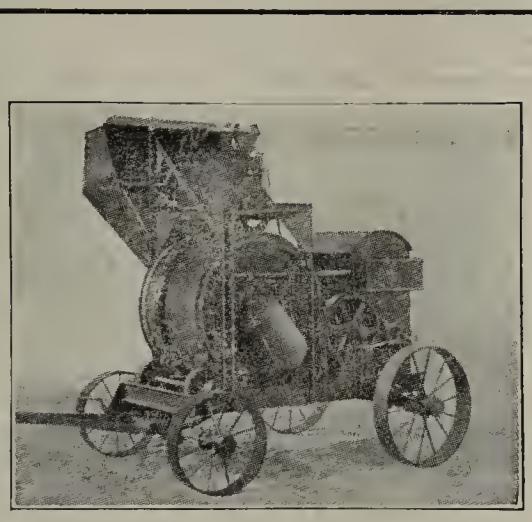
**175 W. Jackson Blvd. CHICAGO**

# AUSTIN

## *The One Prime Requisite*

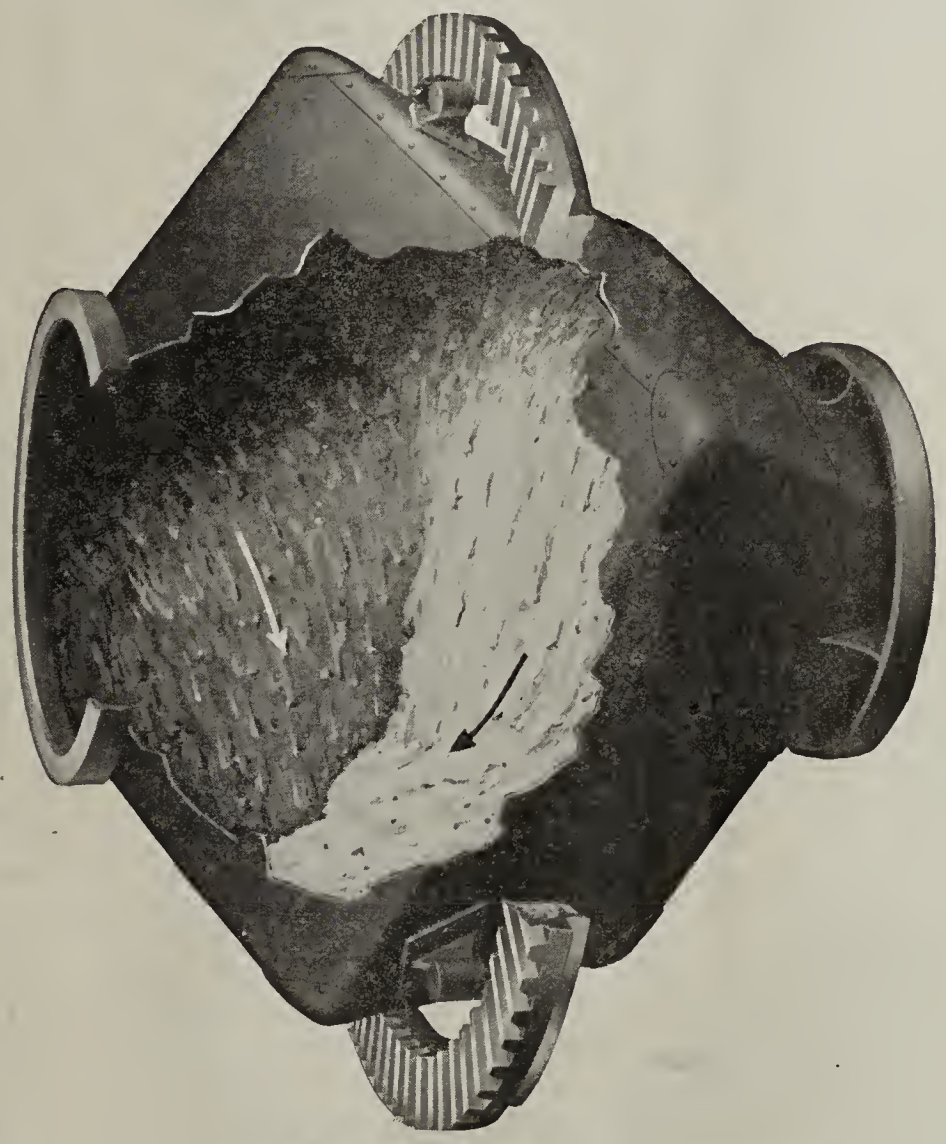
of a Money-Making Concrete Mixer is the ability to Mix Scientifically.

Say all you please about operating speed, efficiency, dependability, etc., the one thing you require of a mixer first, last and all the time is the ability to produce in the shortest time the best possible concrete with the materials and proportions available. That's scientific mixing — and although it costs more to buy, you can't get maximum return without it.



For those who are satisfied with the "blade" type drum the Austin Drum Mixer is a most logical piece of equipment. Nowhere has it found its equal in round drum mixers.

If a mixer of this type is desired ask for Catalog 21-D



## AUSTIN CUBE MIXERS

mix by kneading the mass as a unit. Study the cube. Imagine it to revolve. Note the zig-zag travel of the center line and how the alternating angle of each opposite side, as it comes up, folds the upper portion of the mass over upon itself, always toward and past the center.

That's scientific mixing.

That's "Cube" mixing.

That's the greatest money-making feature known in mixer design.

And that's why you could afford to pay for a "Cube" almost double the price of an ordinary drum mixer.

If you want to know more about "Cube" mixing just ask for Catalog No. 21

# F. C. AUSTIN COMPANY, Inc.

***The Products of Municipal Engineering & Contracting Company are now being marketed by us.***

**Main Office Railway Exchange, Chicago** **New York Office, 30 Church St.**

The
KENT

A Specially Designed

## Mixer for Products Plants

Seventy per cent of the bigger block, tile, brick and specialty concrete products plants of the country use the famous Kent Mixer.

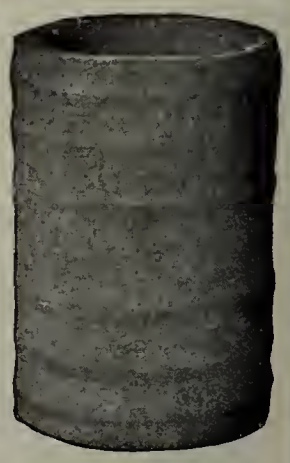
Equipped with automatic feeding device, it makes certain a proper proportioning of aggregates and being continuous in operation, it saves time and labor. The biggest concrete products plant in the world has found that four Kent machines will mix fast enough to keep its many tampers and mold machines busy.

**Write today for descriptive literature and prices.**

## THE KENT MACHINE CO.
Kent, Ohio



## The Biggest Tile Business on Record



Get action now. Big spring buying of drain tile will start soon—and it will be the biggest on record. Cement tile is needed wherever farming is done. Thousands more tile plants are needed to fill the demand.

Equipment must be selected and installed, manufacturing perfected, and a stock of tile made up—all within the next few weeks. Enlist our co-operation.

Dunn equipment is standard. It represents the minimum necessary investment, is sold on a strict guarantee to satisfy, and on 15 days' trial. Ask for the book, "Cement Drain Tile"; we send it free.

## W. E. DUNN MFG. CO.

**414 24th Street HOLLAND, MICH.**

*"Stonekote" residence at Hinsdale, Ill.*

## "Stonekote" Rough Cast

The only cement plaster for all exterior surfaces—rough cast, float coat, trowel finish, or polish finish. As hard as natural stone; made in any non-fading color desired. Stonekote is shipped as a dry material; any mechanic can mix and apply. It is the only perfect waterproof and wear-resisting plastic finish to give permanent and delightful results.

*Write for Booklet*

## Garden City Sand Co.
25 North La Salle Street
CHICAGO, ILL.

# Winter

## *Doesn't Stop the Sealing Vault Business*

There is a constant demand the year round A demand that you can supply with just one set of our Steel Molds. Think how nice it would be to have a neat little income during the winter months and all the year round.

## The AUTOMATIC SEALING VAULT

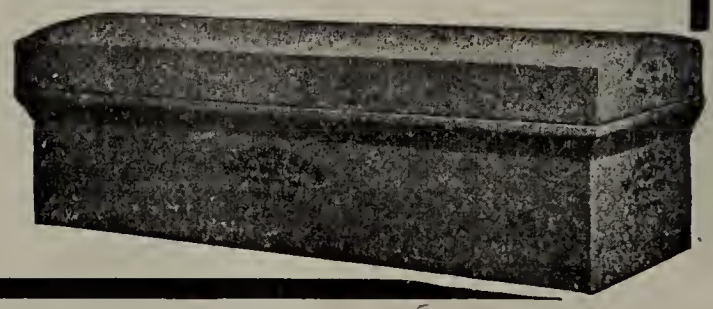
pay big profits from fifteen to 24 dollars on each one. You can develop this as a side line or devote all your time to it. Make the dollars come in this winter by making the AUTOMATIC SEALING VAULT

The First Step is to send for information. We'll furnish full details and particulars. Write Today.

## The Automatic Sealing Vault Co.

**216 East River Street - - Peru, Ind.**

The Finished Vault



# CUT YOUR COAL BILLS
## 25% to 40%

We guarantee to do it. And, furthermore, to make this saving for you YEAR AFTER YEAR. It won't cost you a cent to prove the remarkable efficiency of

## BURNALL
## FUEL SAVER

This device works automatically; cannot burn out or get out of order. It creates a uniform heat and an abundance of it—eliminates clinkers—reduces the smoke nuisance—prolongs the life of your heating plant and increases its efficiency—and MAKES SATISFIED TENANTS.

*Ask for the free book, "COMBUSTION"*
*—It means dollars to you*

**BURNALL CORPORATION**
HARRY C. TUCKER, President
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*Some Territory Still Open for Live Representatives*

# IMMEDIATE DELIVERY
"Franklin"

ROUND—SQUARE—FLAT—SQUARE TWISTED

## STEEL BARS
for CONCRETE REINFORCEING

We can meet your Reinforcing Steel Requirements. This means not only quick shipment from the mills but co-operative service for rapid transportation. If you want to know just what your exact cost will be, send us the Blue Prints and we will give you a lump sum bid on all the steel sheared to lengths, bent to specifications and delivered to the job,

*Our Engineering Department is at your service.*

**The FRANKLIN STEEL WORKS**
FRANKLIN, PENNA.

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Philadelphia. 2215 Race Street
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QUALITY SERVICE

# The Waterloo Bar Bender will pay for itself on the first job

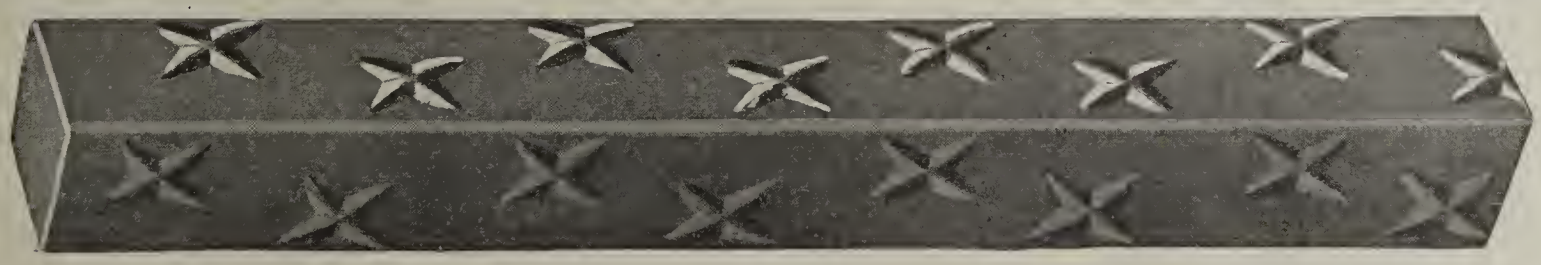
No. 2 Machine Bends to including 1⅛" Bars, weighs 110 lbs. Price.....$18.00
No. 3 Machine Bends to including 1½" Bars, weighs 210 lbs. Price..... 23.00
Machine Stand weighs 90 lbs. Price..... 10.00

The price of this bender is returned to you in time and money saved on your first job, and the machine itself is indestructible, so you multiply this saving year by year.

Makes bends at various angles to meet any design. Bending posts of turned steel. The post that revolves through the slot in the plate is equipped with loose steel roller to keep bar from creeping during bending. Machine is furnished with detachable handle 7 ft. long. No. 2 machine is especially adapted for field work.

**Waterloo Construction Co., Waterloo, Iowa**

# Inland Deformed Bars



In Open Hearth Steel (New Billet Stock), Hard Grade, and Rail Carbon Steel (Rerolled).

The mechanical bond is theoretically correct and is guaranteed by us, having been designed by expert concrete engineers and approved generally by engineers and architects.

The corners are rounded to prevent splitting of the concrete. Bending, fabricating and setting are easily done with these bars. Sizes ⅜ to 1¼ inch. Lengths up to 85 feet.

Prompt shipments during 1918.

**INLAND STEEL COMPANY First National Bank Bldg., CHICAGO**

# Stroh Process Gears and Pinions—

*WEAR LONGER—*

***Reduce the repair account and Increase the tonnage.***

Where the service is heavy and would quickly wear out other materials, Stroh Process Castings show a remarkable economy.

*A definite cash refunding guarantee is given with a trial order.*

May we send you our booklet telling of the Stroh Process and its achievements? You will find it intensely interesting and, we believe profitable also.

**STROH Steel-Hardening Process Co.**
**PITTSBURGH, PA.**

F. LLOYD MARK, Western Sales Manager, Monadnock Bldg., CHICAGO

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# Fuller Face Hardened Sprocket and Traction Wheels

Unequaled for severe duty. Proven by test. Their use prolongs the life of chain.

RESULTS:—Increased Efficiency—Saving in Operating Cost.

We manufacture all kinds of wearing parts subjected to abrasion.

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LEHIGH CAR, WHEEL & AXLE WORKS, :: CATASAUQUA, PENN.
NEW YORK, N. Y., 50 Church St. PITTSBURGH, PA., Farmers Bank Bldg. CHICAGO, ILL., McCormick Bldg.

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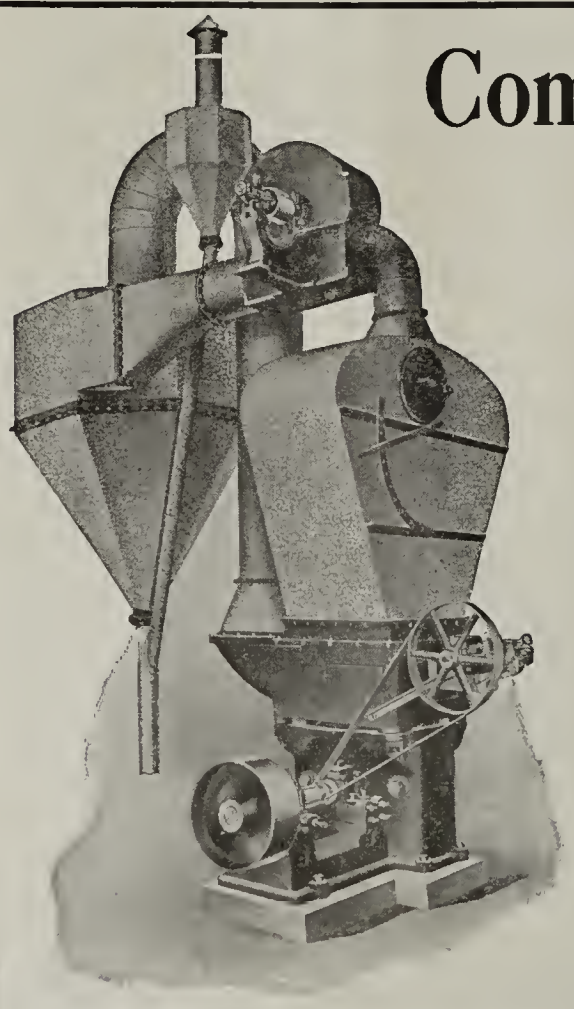

# Complete Grinding

IN ONE

# MACHINE

In successful use grinding Cement, Clinker, Limestone, Coal

INSTANT REGULATION OF FINENESS

NO DUST

*Send for circular*

## THE BONNOT CO.

CANTON, OHIO

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# *Schlueter Rapid Floor Surfacer*

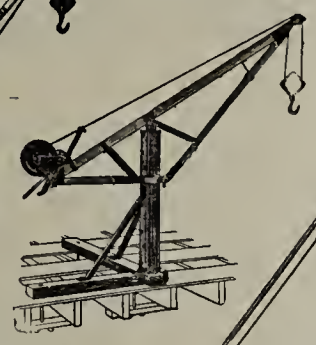
The Schlueter BALL BEARING electric floor surfacing machines for mosaic, marble, composition and wood floors are the most simply constructed machines on the market. Direct chain drive Automatic Dust Collectors.

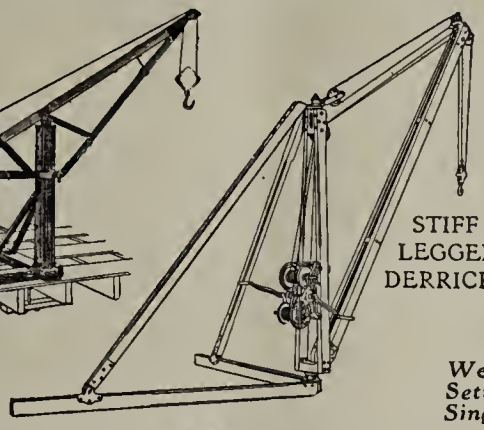
**Over 5,000 in Use All Over the World**

Send for Prices and Free Trial Proposition

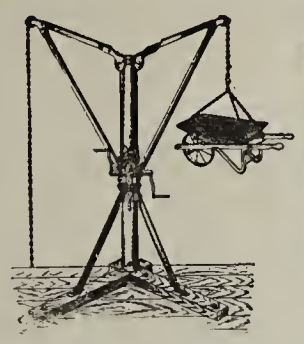
**M. L. SCHLUETER CO.**
**225 W. Illinois Street, CHICAGO**

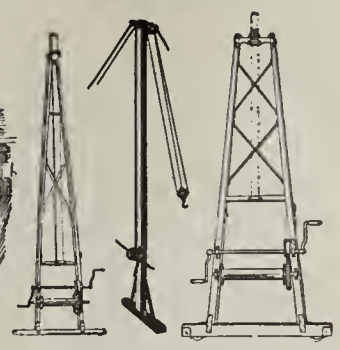
# MOST COMPLETE LINE OF BUILDERS' DERRICKS





STIFF LEGGED DERRICK





Sasgen's is the oldest derrick house in the country. We make the strongest, best and most reasonable price derricks.

*We manufacture Steel and Wood Circle Swing Builders' Derricks, hand and power, Pole Setter "A" Frame, Double Boom Wheelbarrows, Stiff Legged and Guy Line Derricks, Single and Double Drum Geared Winches, Blocks, etc.*

**SASGEN DERRICK COMPANY, Grand and Albany Aves., CHICAGO**

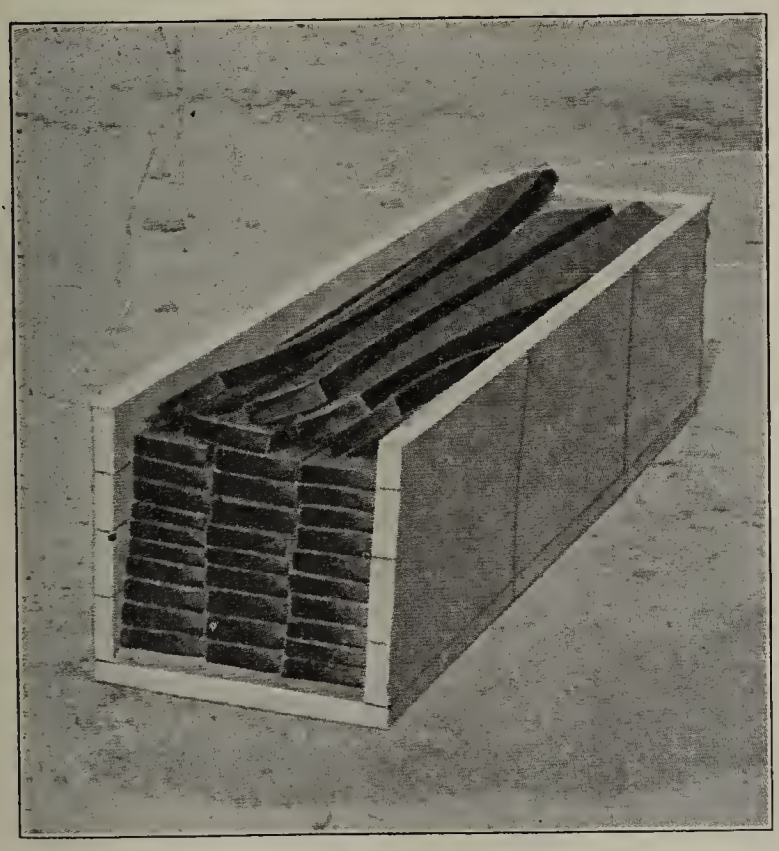
**WRITE FOR CATALOG No. 15**

# ADAMANT SILICA TUBE MILL LININGS GRINDING PEBBLES

Have successfully passed some of the most severe tests. Long life and moderate price. Immediate shipment on stock sizes. Write for prices.

**Jasper Quarry Co., Sioux City, Iowa**

# Genasco Expansion Joints



have all the advantages of other prepared joints for concrete, wood-block, brick and granite-block pavements—**economy, ease of installation, the avoiding of melting and pouring**—and besides this

## Are All Asphalt

The **entire thickness** of a Genasco joint serves the purposes of expansion and contraction. Ready-made joints that contain felt or some other form of re-enforcement cannot do the work of the Genasco all-asphalt joint. Any thickness or depth.

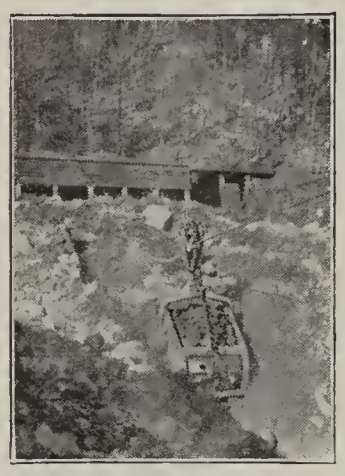
The best way to judge this joint is to see it. A life-sized sample will be sent to any one interested. Write for it today.

**THE BARBER ASPHALT PAVING COMPANY**

**Philadelphia, Penna.**

# SHEARER & MAYER DRAGLINE CABLEWAY EXCAVATOR

(PATENTED)



Digging
Boulders and Gravel

Conveying and Elevating to Screening Plant

A simple, efficient, rapid and economical machine known for its wide area of operation and efficient excavation of material from either wet or dry pits. Digs, conveys a distance of 500 feet or more. Elevates and dumps the material into bin, screens, cars, wagons or storage piles.

## Mr. Gravel Producer:

If, by the use of one machine you could eliminate a complicated excavating and conveying system at your gravel plant, would you not be interested? Then study the above cuts. Note the absence of men in and about the pit and figure the saving in labor cost alone, to say nothing of the saving of fuel and maintenance cost, made possible by a well designed, substantially constructed dragline cableway excavator.

**ONE MACHINE—ONE OPERATION—ONE MAN CONTROL**

Dumping Into Hopper Leading to Crusher and Screens

**Write for Illustrated and Descriptive Booklet. Information Furnished Free.**

## SAUERMAN BROS., 1139 Monadnock Blk., Chicago

# The Silo Business will come to you .... if you build CALDWELL SILOS

CALDWELL Silos practically sell themselves. They are storm-proof, water-proof, air-proof, acid-proof, fire-proof, vermin-proof — altogether, trouble-proof. Each stave is a wet mixed reinforced stave having $\frac{3}{8}$" bar of twisted steel placed diagonally in the concrete. And each stave interlocks with the six adjoining staves; is crossed and held in place by three external bands. Caldwell Silos are permanent, moderate priced and favorites with the farmers.

We have the most business-like silo proposition on the market for the man who will push these silos in your community. There is no territory to buy, no royalty to pay. We will start our representative "right." If you are interested in securing this business, write for full information NOW. Don't delay and let a neighbor get your territory.

CO-OPERATIVE CONCRETE CONSTRUCTION COMPANY
OSKALOOSA IOWA

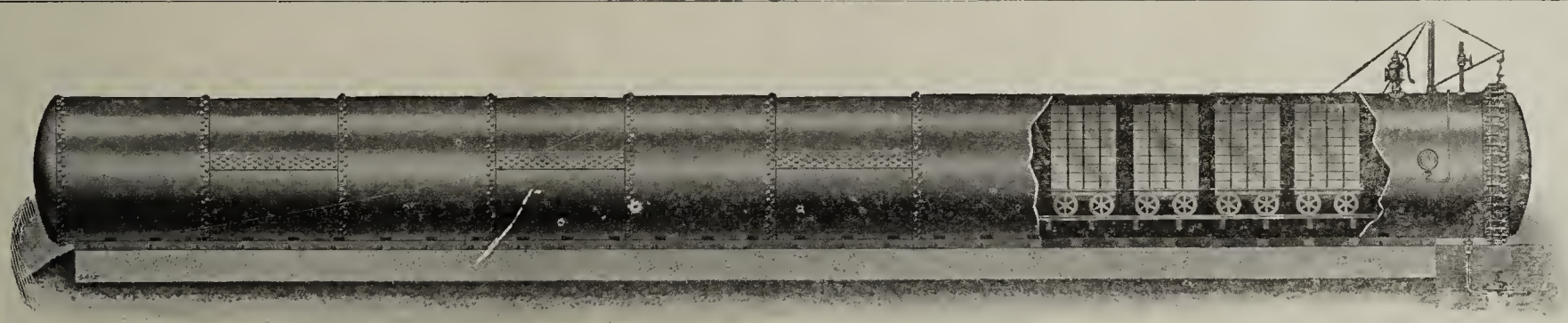
# Sand Lime Brick Machinery

Our complete line of Sand Lime Brick Machinery makes it possible to secure just that machinery which is required to make your plant a success. We favor no particular type of machinery but are guided by the needs of the customer. Our wet and dry grinding mills have transformed a number of unsuccessful plants into dividend producers, while our Presses, Mixers, Hardening Cylinders and other equipment are of equal quality. We can exactly meet the demands of any manufacturer with a quality of machinery which will operate at a profit with a minimum amount of attention and expense.

*Correspondence solicited*

## The American Clay Machinery Co.

WILLOUGHBY, OHIO



# For Facing Concrete Work

No other material can quite compare with Middlebury Terrazo. It is furnished carefully graded to size—in either dust, No. 1, 2 or 3.

It is made from Middlebury White and Creme Statuary Marbles; and when used for facing stucco work gives an appearance equal to that of solid marble, and with all the advantages of marble, at a material saving in price.

**Send for samples and prices.**

## Middlebury Marble Company

**Brandon, Vermont**

# Cut Gears

**Spur,**
**Spiral,**
**Bevel and Worm**
**Steel and Rawhide**

***Accuracy and Prompt Delivery***

When you want a gear cut you want it **quickly,**—we emphasize our promptness without sacrificing accuracy.

## Ganschow Cut Gears

stand first in accuracy—perfect mesh—silent operation and the quality that counts for long service.

*Estimates furnished from drawings and specifications.*
*WRITE FOR CATALOG.*

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1003 W. Washington St. - CHICAGO



# SUCCESSFUL CEMENT-ENGINEERS

SOLVE THE PROBLEM OF CONVEYING, ONCE AND FOR ALL, BY ALWAYS SPECIFYING IN THEIR ORDERS

TRADE **SAWYER** MARK
Registered

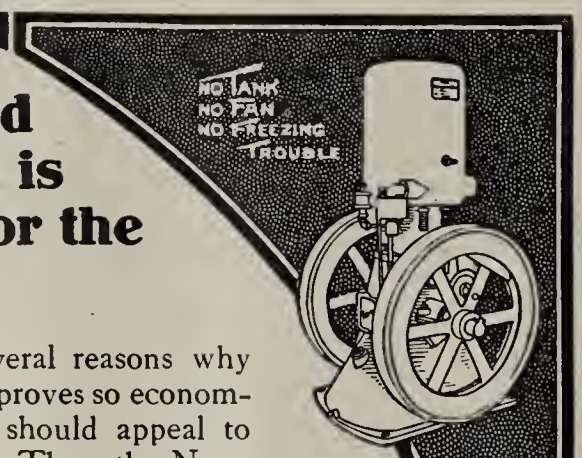
## Stitched Canvas Belting

*The Quality Standard*
*for Over Thirty Years*

**UNITED STATES RUBBER CO.**
**MECHANICAL GOODS DIVISION**
**NEW YORK**



## No Skilled Engineer is Needed for the Novo




This is one of several reasons why the Novo Engine proves so economical and why it should appeal to every contractor. Then the Novo is so light—the lightest engine for power developed—that a lot of time is saved in moving your mixing outfit. Time lost soon runs into money.

# NOVO ENGINE

***"The Engine for Every Purpose"***

The absence of lateral vibration adapts the Novo particularly to the running of cement machinery. Ten sizes, 1 to 15 h. p.

**Send for Novo Catalog**

and look into this question of power. It is worth careful consideration.

**Novo Engine Co.** **Clarence E. Bement**
**Sec'y and General Manager**
**219 Willow Street - - Lansing, Mich.**



# Everything in CUT GEARS

We have the largest and most modern equipped gear making plant in the west. Our gear making machinery embraces everything known that will in any way facilitate the manufacture of high-grade cut gears of all kinds up to 15 feet in diameter.

**Quick Deliveries, Low Prices and**
**First Class Work Our Motto**

## Foote Bros. Gear & M. Co.

**210 to 220 N. Carpenter St., Chicago**

# BLACK GIANT STITCHED DOUBLE BELTING

THIRTY thousand feet of BLACK GIANT DOUBLE STITCHED BELTING in sizes ten to twenty-four inch eight ply furnished within the last sixty days to two of the largest cement plants in the United States. Both of these plants have used BLACK GIANT DOUBLE STITCHED BELTING for the past five years. BLACK GIANT DOUBLE STITCHED BELTING is the most improved cotton belting manufactured today and is adapted for all kinds of work wherever machinery is run, either for transmission of power, elevators or conveyors.

*Manufactured exclusively by*

**McIlroy Belting and Hose Co.**

**Hammond, Indiana, U. S. A.**

**BELTING**

"V-B" Balata
"AMPERE" (Canvas Stitched)
"WHITE SEAL"

Write for Prices, Discounts and Samples

**VICTOR BALATA & TEXTILE BELTING CO.**

Factory: Easton, Pa. Main Office: 38 Murray St., New York
Stores: 167 N. Market St., Chicago, and 87 High St., Boston

**CONVEYOR BELTS A SPECIALTY**

# The Aero Pulverized Coal System

is a **Unit System.** The Pulverizer and the furnace is the unit. There is nothing between them but a plain iron pipe. Coal drying is optional.

The AERO is a no-storage system and therefore free from fire and explosion hazards.

The pulverizing, mixing and feeding operation, as well as the furnace, are at one time under the eye of one man. Write for Bulletin.

**AERO PULVERIZER CO., 120 Broadway, NEW YORK**

# THE FULLER ENGINEERING COMPANY

**Designing, Constructing and Operating Engineers**

**Cement and Hydrated Lime Plants a Specialty**

**Reports, Examinations and Analyses of Raw Materials for Cement Consultations Solicited**

**Offices: Allentown National Bank Bldg.**
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# WATER

SOFTENING OR FILTRATION

FOR BOILER FEED AND ALL INDUSTRIAL USES

WM B SCAIFE & SONS CO PITTSBURGH PA

# The story of HYDRATED LIME

## SHOOTING CONCRETE 4,000 FEET

Out at San Francisco the Twin Peaks Tunnel is being built by R. C. Storrie & Co. It passes through water bearing soil and City Engineer M. M. O'Shaughnessy specified Hydrated Lime in the concrete to make the structure waterproof, eight pounds of hydrate being used to one hundred pounds of cement; the concrete proportions being 1 cement, 2¼ sand and 5 crushed gravel, graded from ¼ to 1¼ inches.

R. C. Hackley, engineer for the contractor, writes:

"On this work the pneumatic concrete placing system is used and we have shot the concrete twenty-six hundred feet through eight-inch pipe and expect to extend this line to four thousand feet or more; the lime being a great help as a lubricant. Where chutes are used they can be much flatter and will carry the concrete much farther with lime in the mix; in fact we have used lime for this purpose and for easier placing in narrow walls and around reinforcement, even when not specified, on account of the labor saved.

"The uniformity of the concrete on this piece of work and the absence of honeycomb patches can be greatly attributed to the use of Hydrated Lime."

*Write any of the following competing manufacturers of Hydrated Lime for complete information about Hydrated Lime in Concrete.*

**Marblehead Lime Co.,** Chicago—Kansas City

**Port Byron Lime Assn.,** Port Byron, Ill.

**Solvay Process Co.,** Moline, Kans.

**Tidewater Portland Cement Co.,** Baltimore, Md.

**Lee Lime Co.,** Lee, Mass.

**Glencoe Lime & Cement Co.** St. Louis, Mo.

**Dutchess County Lime Co.,** Dover Plains, N. Y.

**Palmer Lime & Cement Co.,** 103 Park Ave., New York, N. Y.

**Rockland & Rockport Lime Co.,** New York—Rockland, Maine—Boston

**The A. & C. Lime Co.,** Canton, Ohio.

**Kelley Island Lime & Transport Co.,** Cleveland, Ohio.

**National Lime & Stone Co.,** Carey, Ohio.

**Ohio Hydrate & Supply Co.,** Woodville, Ohio

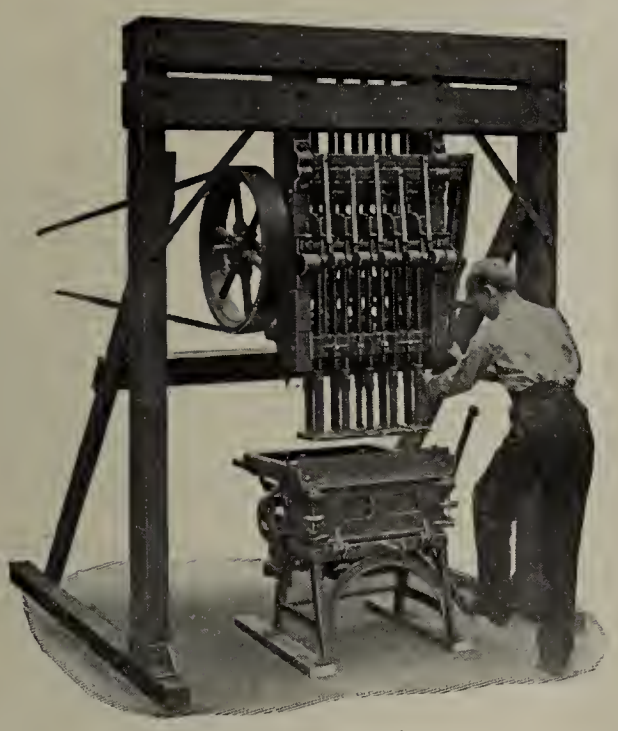
**John D. Owens & Son Co.,** Owens, Ohio.

**Woodville Lime & Cement Co.,** Toledo, Ohio

**Merion Lime & Stone Co.,** Norristown, Pa.

**Vermont Marble Co.,** Proctor, Vermont

**Riverton Lime Co.,** Riverton, Va.

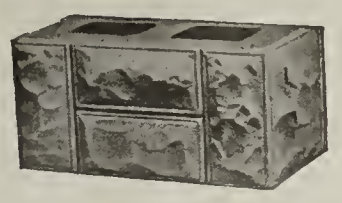


Power Outfit

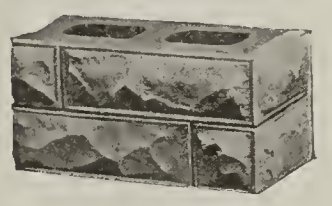
# ONE MACHINE FOR ALL

The Ideal Machine makes any face design or surface treatment possible to secure in concrete. It also makes all your fractional and special blocks easily and quickly. When you put up a building of Ideal Blocks you don't have to patch it up with bricks or broken blocks. Do you realize what this means to your business?

Don't handicap yourself with a machine which limits you to one kind of work. Don't be restricted to foundation jobs. Use

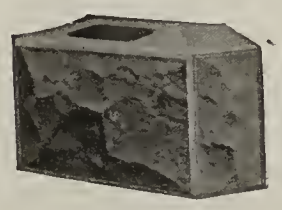


Broken Ashlar Block



Broken Ashlar Block

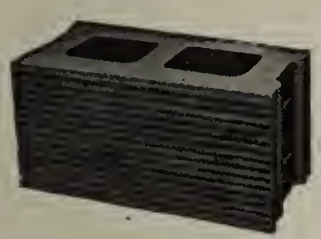
Granite Faced Block



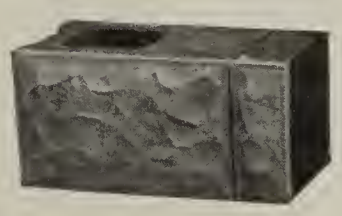
Octagon Block

# IDEAL CONCRETE BLOCK MACHINERY

and supply your community with beautiful artistic building units for residences, bungalows, churches, garages, stores and all other types of structures.



Stucco Block

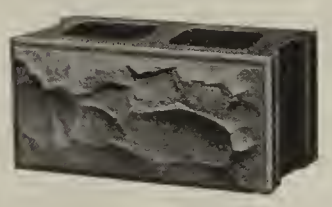


Fractional Block

The Hand Block Machine shown below, with the accessories included in its equipment, is just the machine for anyone starting in the business.

Gable Angle Block

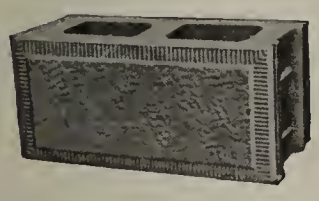
The unit principal of constructing Ideal Machinery enables you to expand and enlarge your plant from a Hand Outfit to the most complete power equipment as your business increases.



Rock Face Block

Panel Block

*Send for our new General Catalog No. 28 covering our complete line of hand and power equipments.*



Bush Hammered 1 in. T. M. Block

Cornice Block

Hand Machine →

## Ideal Concrete Machinery Co.

Windsor, Canada 1353 Monmouth Ave, CINCINNATI, OHIO

THE IDEAL MACHINE MAKES ALL BLOCKS

The **Rugged Ruggles**

**AERIAL CARRIER**

Suspended over Slate Quarry

**SELF DUMP BRAK LOCK ING**

**Built in Two Sizes:—1 to 5 tons capacity, 5 to 10 tons capacity.**

The **Rugged Ruggles** is made for special use on cement and gravel construction work. For all kinds of quarries where the waste is taken from the pit and dumped at the surface It will take any load up to **ten** tons, from any depth to the cable, where it is automatically released and sent either up or down the cable and dumped in mid-air or lowered. One man can operate three **Rugged Ruggles** on as many cables with a three-drum engine:

**No brake to wear the cable—Can run on a flat cable.**

Simple in construction; made entirely of steel; all the sheaves steel bushed or brass, and is backed by years of extensive use.

**Manufactured by**

**Ruggles Machine Co., POULTNEY VERMONT Dept. C**

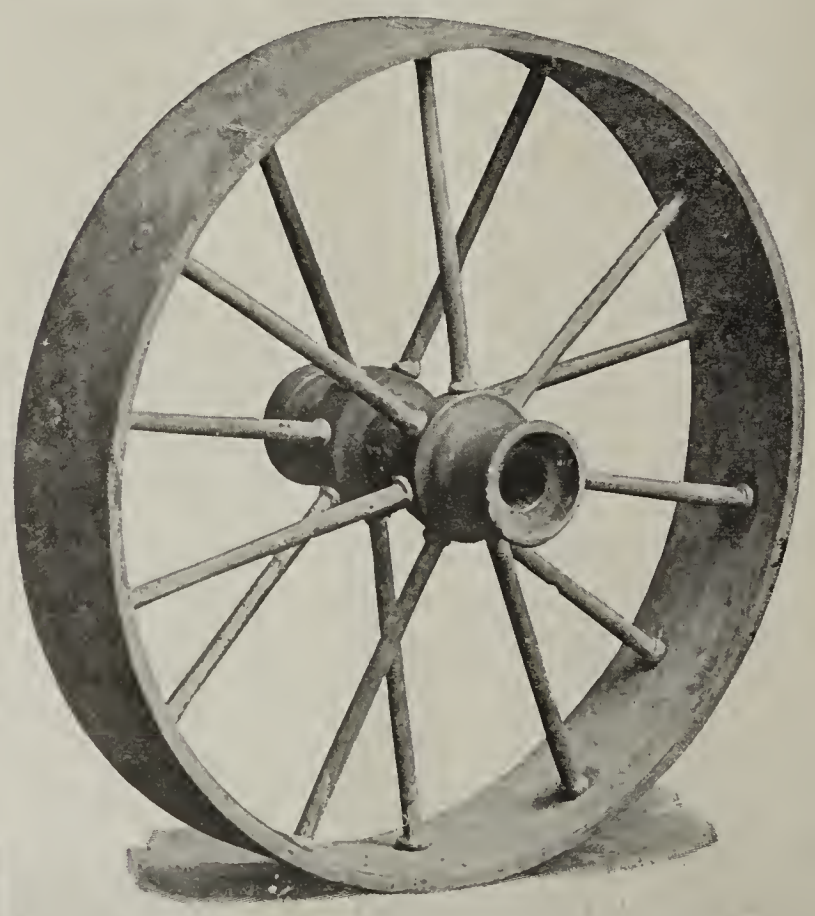


**FRENCH & HECHT**

**Davenport, Iowa** **Springfield, Ohio**

**Metal Wheels in quantity for Manufacturers only**

***Combined capacity 8,000 tons per month***




## QUARRY SUPERINTENDENT WANTED

Quarry Superintendent capable of handling large stone quarry in eastern Pennsylvania. Must be experienced in the operation of boilers, hoisting engines, air compressors, drilling and blasting. Output to quarry must be doubled in the next six months. This is an excellent opportunity for an experienced man, who is a hustler. State fully, age, experience, references, married or single, date available, and salary expected. Address reply to W. W. W., care of CEMENT & ENGINEERING NEWS, 672 Transportation Bldg., Chicago, Ill.

## AIR SEPARATORS WANTED

Wanted to buy second-hand air separators similar to Osborn, Raymond or Stroud make. Address M. N., care of CEMENT & ENGINEERING NEWS, Transportation Bldg., Chicago, Ill.


# Crushing Plant

## PRACTICALLY NEW— IMMEDIATE DELIVERY

2—No. 6 McCully **Gyratory Crushers**
1—No. 5 McCully **Gyratory Crusher**
1—4 ft. x 8 ft. Grizzly, 2 in. **Spacing**
1—**Belt Conveyor,** complete with all fixtures
1—Patnoe **Steel Chain Elevator,** 35 ft. centers
1—No. 8 **Geared Head Elevator;** 69 ft. center.
1—40 in. x. 15 ft. **Pipe Bar Screen**
1—Leyner-Ingersoll **Drill Sharpener**
1—Leyner-Ingersoll **Drill Sharpener** complete with dies, dollies, gauge, etc.
1—7 x 10 Leonard Ball Automatic Stationary Engine
1—16 x 18 Erie Stationary Engine
1—Horizontal Tubular **Economic Boiler,** 125 H.P.
1—General Electric Company **Generator,** 9½ Kw.
4—Canadian-Ingersoll-Rand **Steam Drills** style No. 54, complete with weights and tripods.
1—BCR **Jackhammer**
1—No. 2 Rotary **Class CN Drill,** Chicago Pneumatic Tool Company

**Oscar Daniels Company**

**First National Bank Bldg.** **Chicago, Ill.**



**Henry Heil Chemical Company**

**210 to 214 South Fourth Street, ST. LOUIS, MO.**

We make a specialty of supplying cement works with

**Chemical Apparatus, Chemicals and Reagents**

Gilmore's Needles, Cement Moulds, Vicat Apparatus, Schumann's, LeChatelier's and Jackson's Specific Gravity Apparatus, Etc.

**Pyrometers, Calorimeters**

**High Grade Goods Only**

*Satisfaction Guaranteed*

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**WANT COLUMNS.**
**Advertisements in this column are inserted at the rate of two dollars per inch per issue—and no advertisement will be taken for less than two dollars and must be paid strictly in advance.**

### POSITION WANTED BY CHEMIST

First-class all-around cement chemist open for engagement; will accept nothing but first-class position; familiar with Spanish. Address C. B. W., care Cement & Engineering News, 672 Transportation Bldg., Chicago, Ill.

### FOR SALE

Best quality reinforcements for Posts, Silos, etc. Sharon Concrete Post Co., Van Buren, Indiana.

### FOR SALE

For Sale; Going COAL MINE in Tennessee; 2,880 acre lease; Sixty houses; Electric haulage; Daily capacity 200 tons can be developed to 2,000; Three workable seams high grade coal; Opportunity for consumer to assure fuel supply at actual cost; Several large deposits of good clay suitable for buff brick or tile; Excellent opportunity for CEMENT PLANT, limestone and all raw materials convenient; Easy terms; Box 589, Knoxville, Tenn.

### POSITION WANTED—SUPT. OR CHEMIST.

Chemical Engineer and Cement Expert. Fifteen years' experience in cement manufacture as Head Chemist and Supt. desires position with a Portland Cement Co. as Superintendent, Assistant Superintendent or Head Chemist. Address Cement, 112 Locust St., Barberton, Ohio.

## FOR SALE OR RENT
**Immediate Delivery**

## Dump Cars, Locomotives, Shovels, Etc.

90—12-yd. Western air dump cars.
3—4-wheel switching locomotives, separate tenders.
2—6-wheel switching locomotives, separate tenders.
2—70C Bucyrus Shovels. Shop Nos. 1351 and 1410.
2—Western standard gauge spreader cars.
35—1½-yd, 24-in. gauge Western side-dump cars.
4—box cars and 2 flat cars.
Miscellaneous extras, repair parts, etc., for above equipment.
Also considerable other equipment for contractors, quarries and gravel pits, such as clam shell buckets, drag lines, crushers, drills, locomotive cranes, pumps, boilers, wire rope, hoisting engines, compressors, rails, etc.
What are your requirements? Please telegraph, telephone or write us.

**CLAPP, NORSTROM & RILEY, 12-14 So. Canal St., CHICAGO, ILL.**

## WANTED

**Locomotive Cranes**

**Hoisting Engines**

**Standard Gauge Saddle Tank Locomotives**

**F. MAYER**
**1601 Monadnock Bldg.**
**CHICAGO, ILL.**

## Second Hand Equipment—For Sale

### MARSH'S GUARANTEED LIST

**Buckets**
1—2 -yd. Hayward
4—1½-yd. clam-shells, various makes
1—1 -yd. orange-peel bucket
1—1 -yd. Page Dragline bucket
1—2 -yd. Page Dragline bucket
1— ¾-yd. Slack-line outfit complete

**Cars**
20— 4 -yd. Western 36-in. gauge cars
20— 1½-yd. Western 24-in. gauge cars
30—12 -yd. Western standard-gauge cars
30— 2½-yd. quarry cars, steel bodies
20—60,000 capacity gondolas

**Compressors**
1—Ingersoll-Rand Imperial type X-B-2, capacity 2400 ft., belt-driven
2—Bury Duplex, cap. 500 ft. each
1—Ingersoll-Rand Imperial Type, 2 stage belted, 250 ft. per minute. New
1—14 x 12 Laidlaw-Dunn-Gordon belted
1—Sullivan 2-stage steam-driven, cap. 1800 ft.
Lots of others.

**Locomotives**
2—10 x 16—36-in. gauge dinkies
2— 9 x 14—36-in. gauge, just overhauled
2— 7 x 12—24-in. gauge
1—150-ton Shay, geared, almost new
1—20 x 28 Mogul, good as new
1—90-ton Mikado type, new
2—60-ton 10-wheelers, 170-lb. pressure

**Crushers**
1—No. 5 McCully
1—No. 6 Gates, style K, complete plant
1—No. 7½ Austin, complete plant
1—No. 8 McCully
1—No. 9 Gates K, good as new
1—No. 30 Kennedy
1—20 x 24 Traylor Jaw Crusher
1—Shaft for No. 7½ Gates

**Road Builders Outfit**
10,000 ft. Koppel 24-in. ga. portable track
30 Koppel V-shape 24-in. ga. cars

**Drag-Lines**
1—Page drag-line, 50-ft. boom, 1-yd.
1—White Traction, 40-ft. boom, 1-yd.
1—Class 14 Bucyrus
1—Slack-line outfit complete, 1-yd.

**Hoisting Engines**
2—7 x 10 D.C., D.D., hoists, American
1—9 x 10 3-drum, with swinging gear and boiler
2—10 x 12 D.C., D.D. American, with boilers
1—6¼ x 8 Builders' Hoist, reversible
1—Flory cableway, complete, 1000-ft. span
1—American Swinging Engine

**Cranes**
1—15-ton 4-wheel American, single line
1—15-20-ton Brownhoist, 8-wheeled M.C.B., almost as good as new
1—15-ton Browning, 4-wheeled
1—O & S, 12-ft. gauge, all steel, good as new
2—McMyler 14-ft. gauge, all steel, fine

**Steam Shovels**
1—No. 1 Thew traction shovel, 1-yd.
1—No. 0 Thew shovel, first-class
1—18B Bucyrus Traction
1—Model "41" Marion st. gg. trucks
1—Model "60" Marion 2½-yd. dipper
1—Model "61" Marion, extra high boom
1—70-ton Bucyrus, first-class
1—Model "50" Marion, almost new

**Rollers**
1—10-ton, 3-wheeled
1—10-ton Austin gasoline
1— 8-ton tandem

**Rail**
3,000 tons, from 30 to 60 lb.

**Miscellaneous**
1—Keystone Excavator, new last winter
1—10 x 6 x 10 Duplex steam
1—10 Morris Sand Pump
1—No. 2 Vulcan steam hammer
20—Steam drills, various sizes and makes
2—Steam Tugs
4—Dump scows
4—Tanks, various sizes
1—Holt 40-60 Caterpillar tractor
1—Huber Steam Tractor
1—Western Elevating Grader, good as new
1—Derrick car, 9 x 12, 3-drum engine, with claw shell, good condition

***If you don't see it here, write anyhow and we will get it for you.***

**MACHINERY WAREHOUSE & SALES COMPANY,** *Successors to* **GEO. C. MARSH & CO.**

**Tel. Harrison 5799**

**750 Old Colony Building, CHICAGO**

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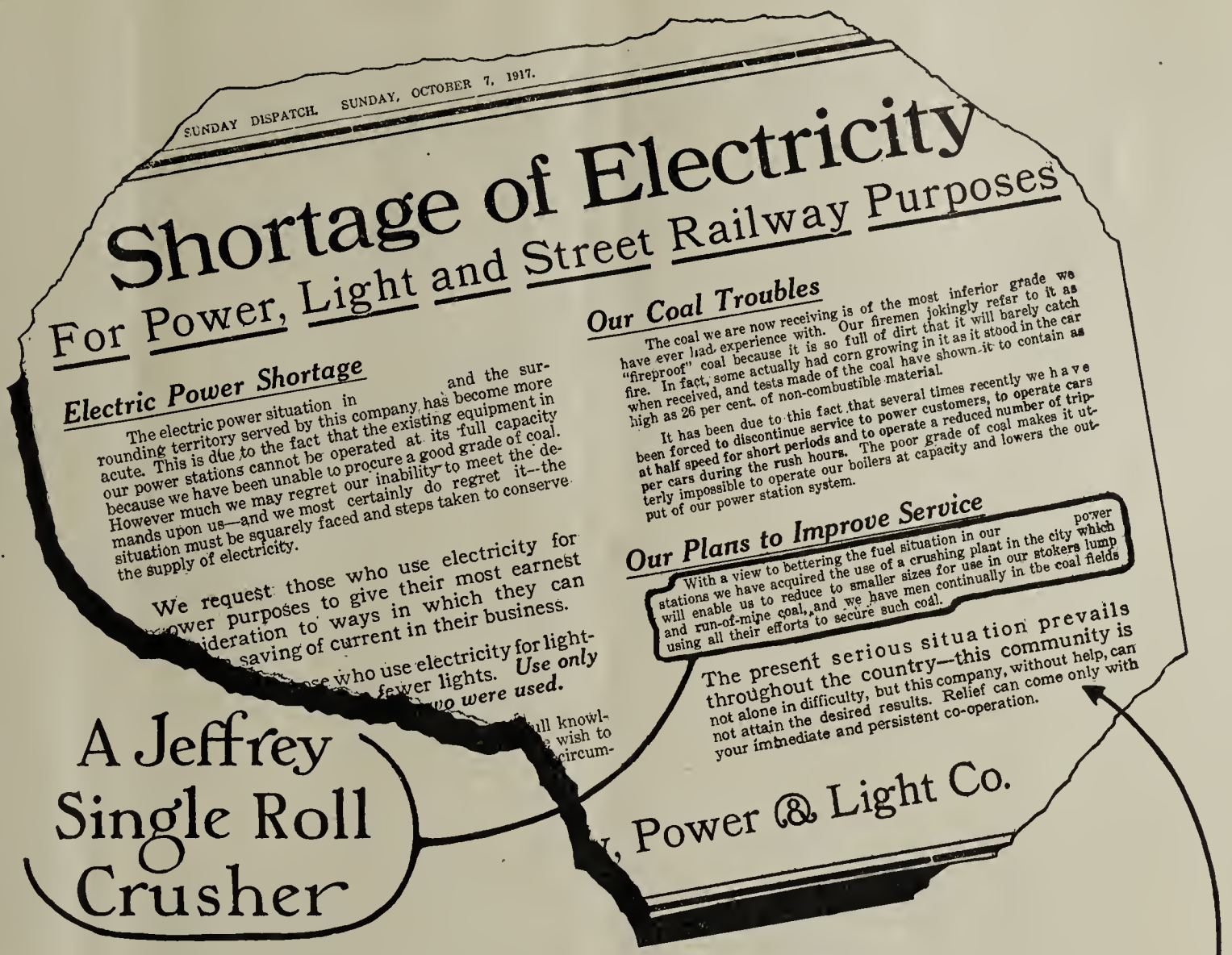


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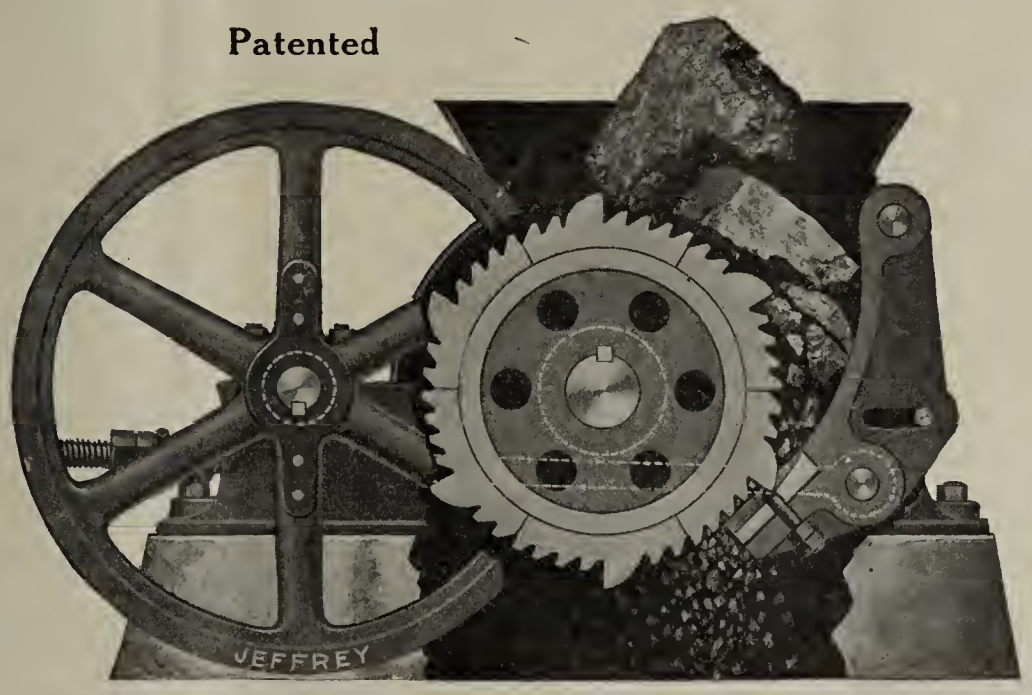
IF so, why not Crush your Run-of-Mine or Lump Coal right in your own plant with a

Patented

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## SINGLE ROLL
## Coal Crusher

Reduces Run-of-Mine or Lump Coal for Stokers — for Feed to Dryers or to Finishing Mills

*Bulletin No. 141-D fully describes this machine—tells what it has done for others*
*Send today for your copy*

## The Jeffrey Manufacturing Company

914 North Fourth Street, Columbus, Ohio

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## is an economical and profitable process In Many Cement Mills

It has been estimated that one third of the country's requirements for Potash could be obtained from the cement industry alone, by the Electrical Process of Dust Precipitation.—A complete line of—

**Westinghouse Electrical Equipment**

has been developed, specially designed for the Cottrell Process, and is in successfull operation in many plants throughout the country.

**Westinghouse Electric & Manufacturing Co.**
**East Pittsburgh, Pa.**

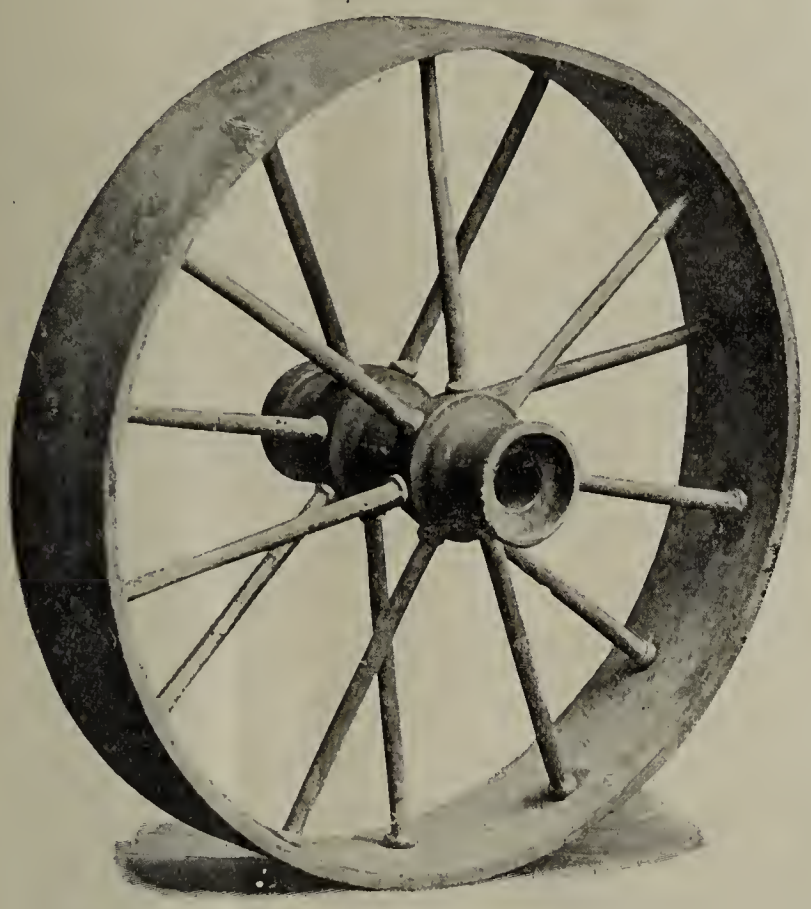
# Westinghouse

# FRENCH & HECHT

Davenport, Iowa Springfield, Ohio

**Metal Wheels in quantity for Manufacturers only**

***Combined capacity 8,000 tons per month***



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TRADE **SAWYER** MARK
Registered

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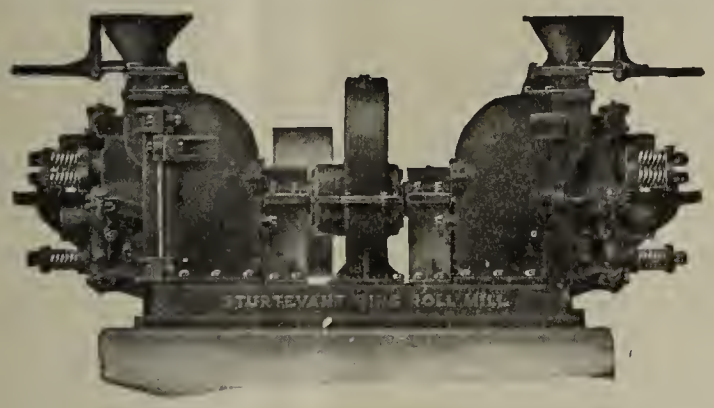
*Built to Satisfy*

**United States Rubber Co.**
**Mechanical Goods Division**
**NEW YORK**

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## For CLINKER, LIMESTONE and COAL

**THE LARGEST PRELIMINARY GRINDER BUILT**

CAPACITY PER HOUR ON CLINKER

80 TO 120 BBLS. TO 20 MESH WITH 80—90 H. P.
50 " 80 " " 40 " " 80—90 H. P.
50 " 60 " " 80 " " 80—90 H. P.

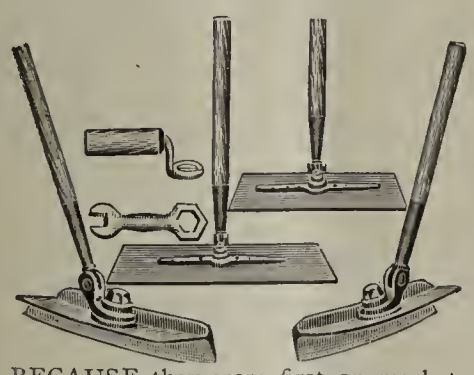
UPKEEP APPROX. $\frac{1}{10}$c. PER BBL.

he Ring-Roll Tube Mill Unit can produce cheaper cement from every standpoint — upkeep capacity, low power and continuous operation than any other. Ask the users, they can prove it to you, and we can.

SEND FOR CATALOGUE

**STURTEVANT MILL COMPANY - BOSTON, MASS.**

NEW YORK PITTSBURGH CHICAGO DENVER LONDON, ENG.



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BECAUSE they were first on market and have stood the test.
BECAUSE they are adjustable to any angle or height.
BECAUSE you can do your work quicker, easier and better.
BECAUSE one man can do work of five with short handled tools.
BECAUSE they save you time, labor and money.
BECAUSE you can try them 10 days against any others on the market; if you don't like ours better, send them back.

*Write for catalog or set on trial.*

**Arrowsmith Concrete Tool Co.** (Bank Bldg.), **Arrowsmith, Ill.**

# Henry Heil Chemical Company

**210 to 214 South Fourth Street, ST. LOUIS, MO.**

We make a specialty of
supplying cement works with

## Chemical Apparatus, Chemicals and Reagents

Gilmore's Needles, Cement Moulds, Vicat Apparatus,
Schumann's, LeChatelier's and Jackson's
Specific Gravity Apparatus, Etc.

**Pyrometers, Calorimeters**

**High Grade Goods Only**

*Satisfaction Guaranteed*

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## Saves Money All Along the Line

The dependable, powerful Acme solves the problem of haulage. At pit or quarry—at the mill—for maker or for dealer—this sturdy truck hauls for less.

**Extra** strength for heavy service is built into the Acme—without excess weight. The ideal truck for stone and building material haulage.

ACME

REG U. S. PAT. OFF.

## Proved Units Are a Quality Bond

Acme **proved** units are acknowleged perfections, combined in the Acme to yield better service, at much lower cost per mile.

Timken Axles, Timken Bearings, Timken Worm Drive, Continental Motor, Detroit Springs, Cotta Transmis-ion, Pierce Governor, Ross Steering Gear, Long Radiator, Pressed Steel Frame—and so on. Each unit a master contribution to a master truck.

*Write for free book, "A Pointer to Profits"*

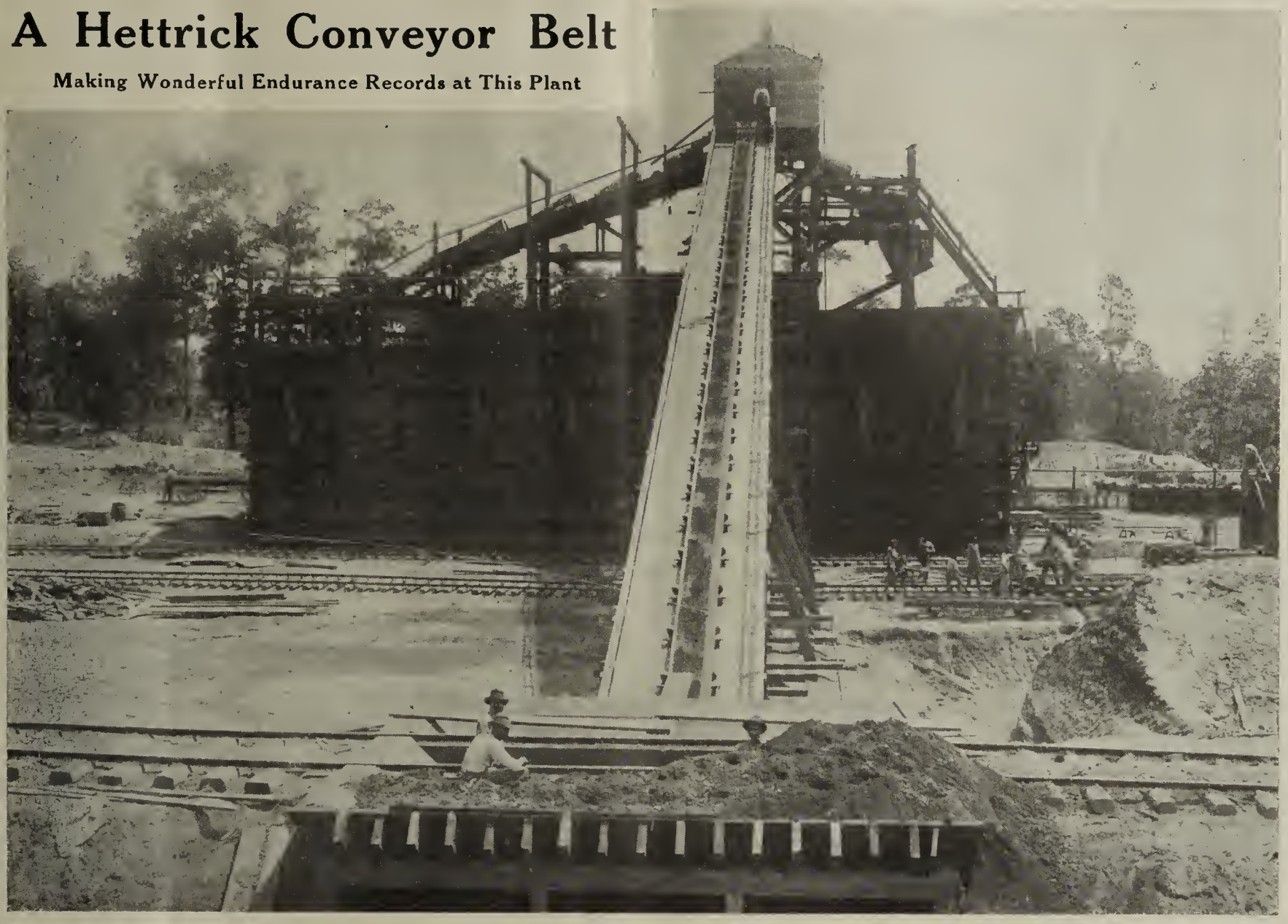
## ACME MOTOR TRUCK CO.

**103 Mitchell Street, Cadillac, Michigan**

**One-ton to Four-ton models. Each oversized in both capacity and dimensions.**

# A Hettrick Conveyor Belt

**Making Wonderful Endurance Records at This Plant**



***"Has given us better satisfaction than any other belt we have ever used"***

writes J. L. Thomas, Superintendent, Tioga Gravel Co., Alexandria, La., whose plant is illustrated above.

The success of Hettrick Red Stitched Canvas Conveyor Belting is a plain case of "survival of the fittest." When mills similar to yours come back repeatedly with orders covering their conveyor belt requirements—what stronger evidence of merit can you ask?

The rains of spring, the heat of summer, the droughts of autumn the cold of winter, may do their utmost, but Hettrick continues on the even tenor of its way, doing its work faithfully and well, be it outdoors or indoors.

As a piece of workmanship it is the perfection of cotton weaving. As a transmitter of power it is unsurpassed. As a conveyor it is unequalled.

We would like to send cement and lime manufacturers and gravel, sand and crushed stone producers a sample and folder that tells the whole story of Hettrick Conveyor Belting.

## The Hettrick Mfg. Co.

TOLEDO, OHIO

# "We Are Well Pleased"

## with our Symons Disc Crusher

*The product derived from this crusher is very satisfactory. We have been using a Symons Crusher for six years. Present crusher is 36 inches, formerly had a 24 inch—writes, The Carmichael Gravel Co., Williamsport, Ind.*

Equip Your Gravel and Crushed Stone Plant with a

# Symons Disc Crusher

It will increase your output, lower your costs and deliver a more uniform material.

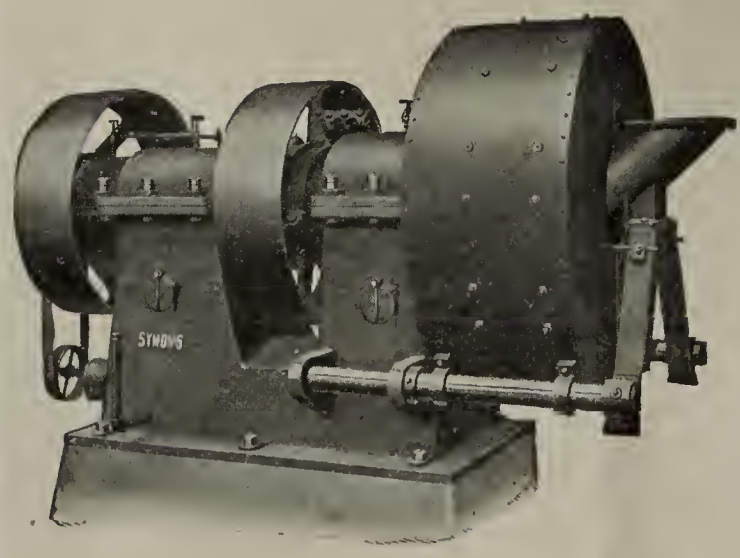
Built in four sizes: 18 in., 24 in., 36 in., and 48 in. Capacities from 5 to 120 tons per hour

**PROMPT SHIPMENT DURING 1918**

Manufactured and Sold only by

## Chalmers & Williams

Chicago Heights, Ill.



# Big Profits

## Making Vaults

Easy to make, and easy to sell.

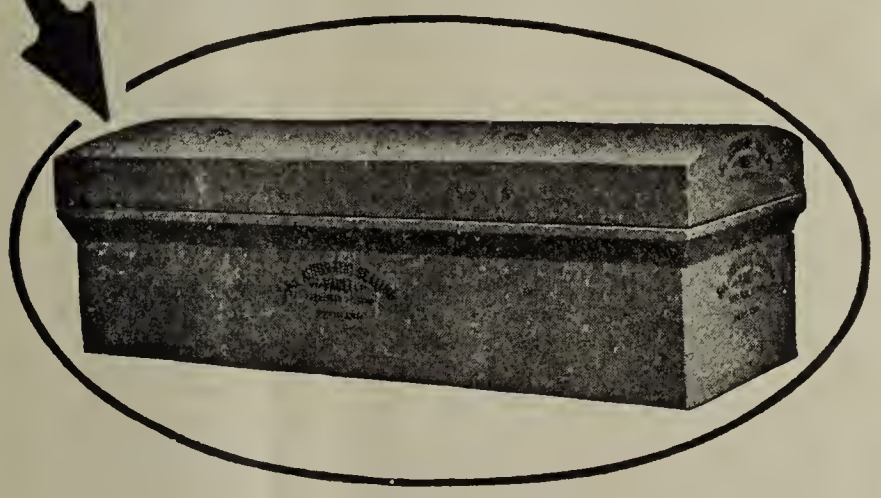
Automatic Sealing Vaults assure big profits and steady work.

You can make these vaults in your spare time, or start a business of your own. The only equipment necessary is a set of our Adjustable Steel Molds.

The Automatic Sealing Vault automatically seals itself when the cover is put on; and protects a burial casket forever against water, vermin, and decay. It is cheap enough for everyone and appeals to everyone.

Write for full information.

**The Automatic Sealing Vault Company**
**216 E. River St.** **Peru, Indiana**



**Deliver**
**Wet Mix**
**Direct**
**Into Forms**

# ARCHERS DO MORE

Archer Mixers do more for the contractor than any other mixer can. They do it because they are years ahead in design and construction. Just two of the many exclusive features that enable them to cut labor costs are:—

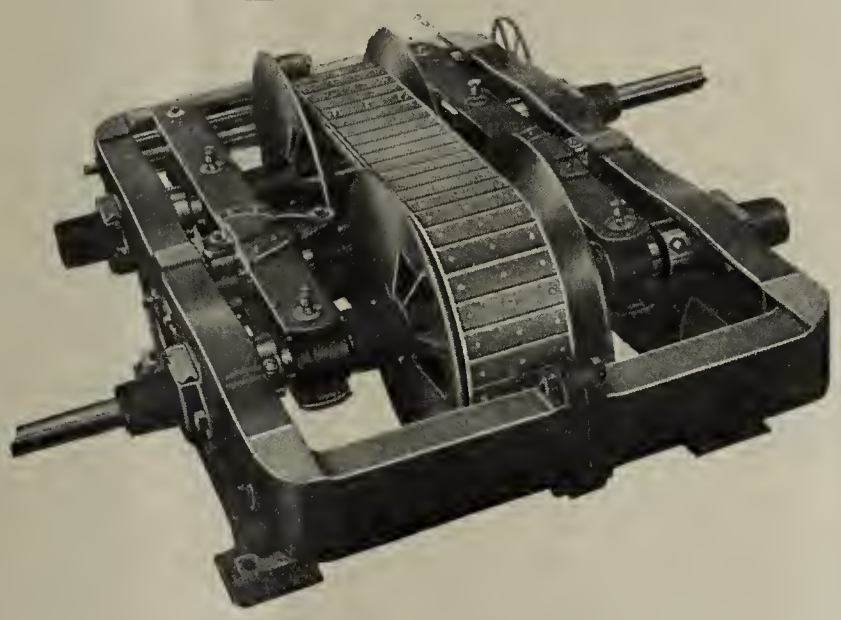
END DISCHARGE—Mixer can be backed up to the work and so discharge wet mix direct into forms. Saves three wheelers.

PORTABILITY—Two wheeled truck, so perfectly balanced that one or two men can move the entire mixer anywhere on the job.

ARCHER MIXERS are made in one model only: two sizes, one bag and half-bag. Write for prices and terms of our "show me" offer.

**ARCHER IRON WORKS**
**2513 W. 34th Place** **CHICAGO**

# Prepare Yourselves Now



against the serious problem of labor shortage. Thousands upon thousands of our young men are being called to the colors.

Sooner or later, we are bound to feel the loss unless we protect ourselves now against such privation of men.

We must utilize such mechanical devices as will increase our present production to the fullest extent. Such a modern device is found in

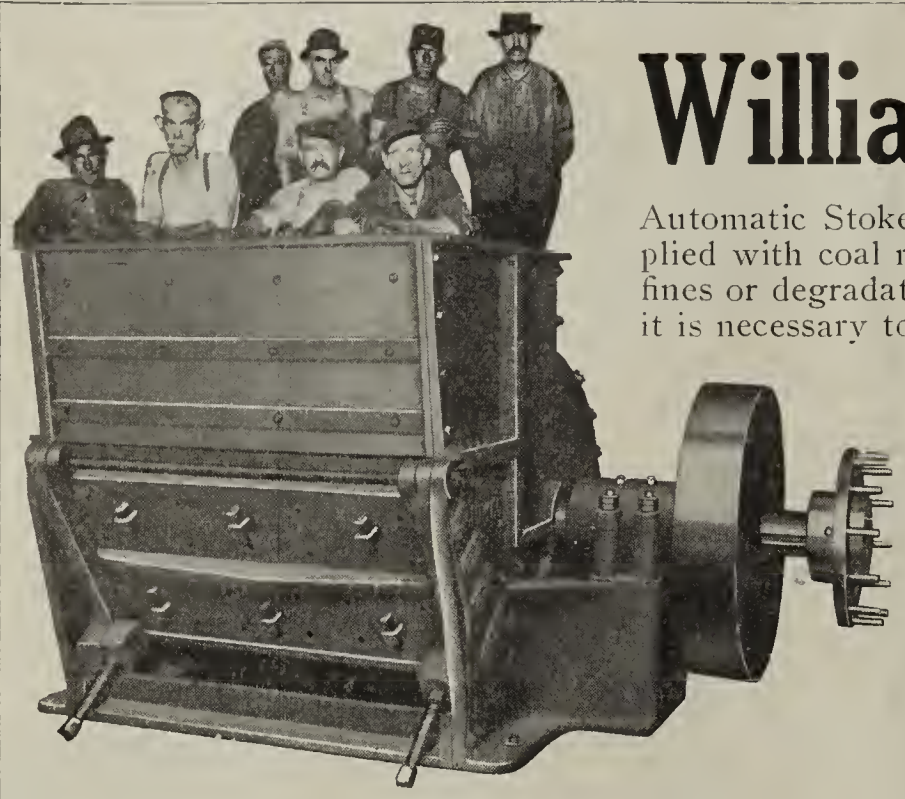
**"THE REEVES" Variable Speed Transmission**

Wherever you need speed production in your kiln proper, or any other place about your mill, our twenty years of experience have proven "THE REEVES" Transmission always fills the bill.

Our advice and service are yours for the asking. We never recommend an installation which does not mean profit to the owner.

**REEVES PULLEY COMPANY**
**COLUMBUS,** **INDIANA**

**Chicago Branch: Cor. Clinton & Monroe Sts.**



# Williams Coal Crushers

Automatic Stokers and Chain Grates give the best results when supplied with coal ranging from 1½" down to ¾", with the minimum of fines or degradation. These sizes, however, are difficult to secure, and it is necessary to purchase instead, run of mine and lump sizes. This again makes it necessary for the consumer of coal to crush these sizes down to such size as will give best results on chain grates and stokers.

For this work the Williams Crushers are unexcelled, hundreds of Williams crushers are doing this work every day, crushing thousands of tons of run of mine and lump coal to stoker sizes. For this work Williams crushers are equipped so that the resulting product will be free from fines or degradation as far as it is possible to control degradation.

Paramount reasons why Williams Crushers should be used for this work are, that Williams Crushers are adaptable to all conditions, they are also adjustable to most every size of crushing; one machine often being used for crushing anywhere from 3" to ⅜" at the will of the operator. In addition they are accessible, making renewal of parts or inspection of internal mechanism easy. They are also provided with a Metal trap which gathers in a pocket all stray iron, thus preventing damage to the crusher, a feature not found in any other crusher. Further, Williams Crushers are reliable, as has been demonstrated during the last 22 years, the first Williams Crusher installed being still in active service. Complete information, such as description, specifications, illustrations, etc., will be found in

**BULLETIN No. 17-35**

## THE WILLIAMS PATENT CRUSHER & PULVERIZER COMPANY

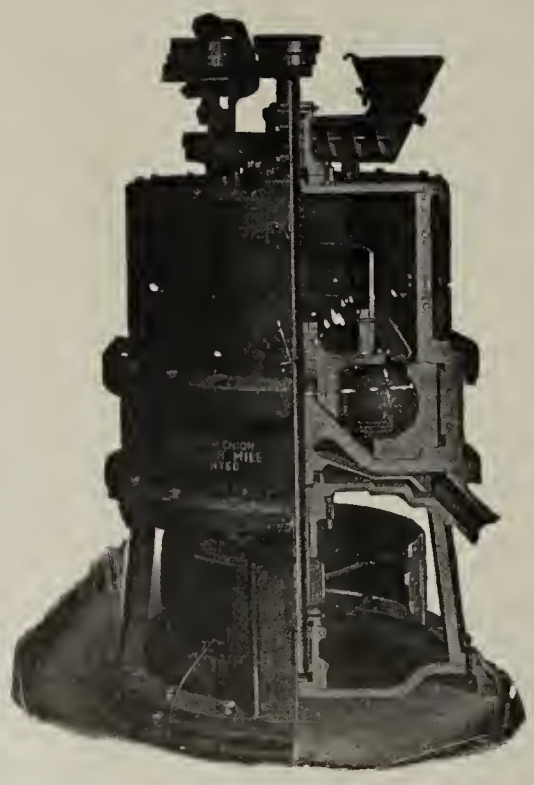
**General Sales Dept.—37 West Van Buren Street**
**CHICAGO**

**Plant**
**ST. LOUIS**

**67 Second St.**
**SAN FRANCISCO**

# THE FULLER-LEHIGH Pulverizer Mill

## *PRODUCES COMMERCIALLY*



**Cement having a higher percentage of Impalpable Powder than can be obtained by any other mill.**

Tests show that the tensile strength of a 1-5 mortar made with cement pulverized by the Fuller Mill is higher than the tensile strength of a 1-3 mortar made with cement pulverized to the fineness required by the Standard Specifications.

**Cement companies equipped with Fuller Mills advertise the fact that the consumer gets 38 pounds more of the IMPALPABLE POWDER or REAL CEMENT in every barrel of cement produced by the Fuller Mill than by any other.**

## LEHIGH CAR WHEEL AND AXLE WORKS

NEW YORK, N. Y.
50 Church St.

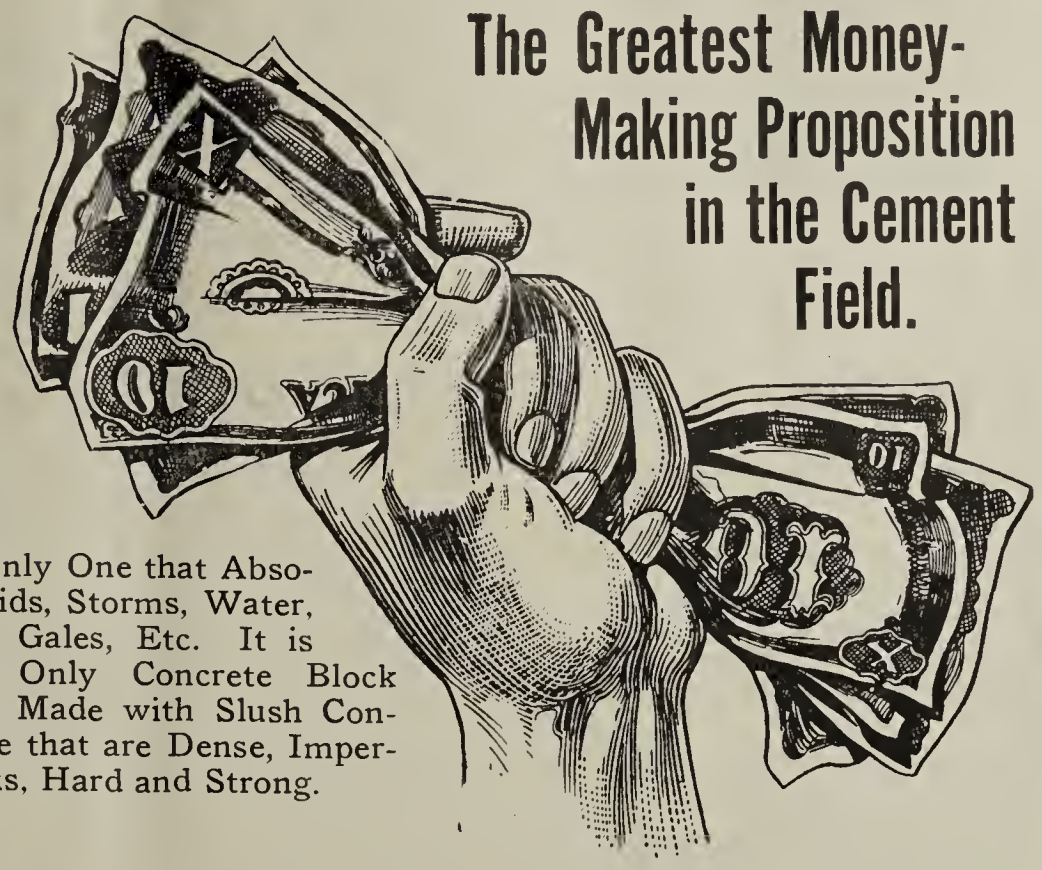
Main Office: CATASAUQUA, PA.
PITTSBURGH, PA., Farmers Bank Bldg.

CHICAGO, ILL
McCormick Bldg.

# YOU CAN MAKE BIGGER PROFITS

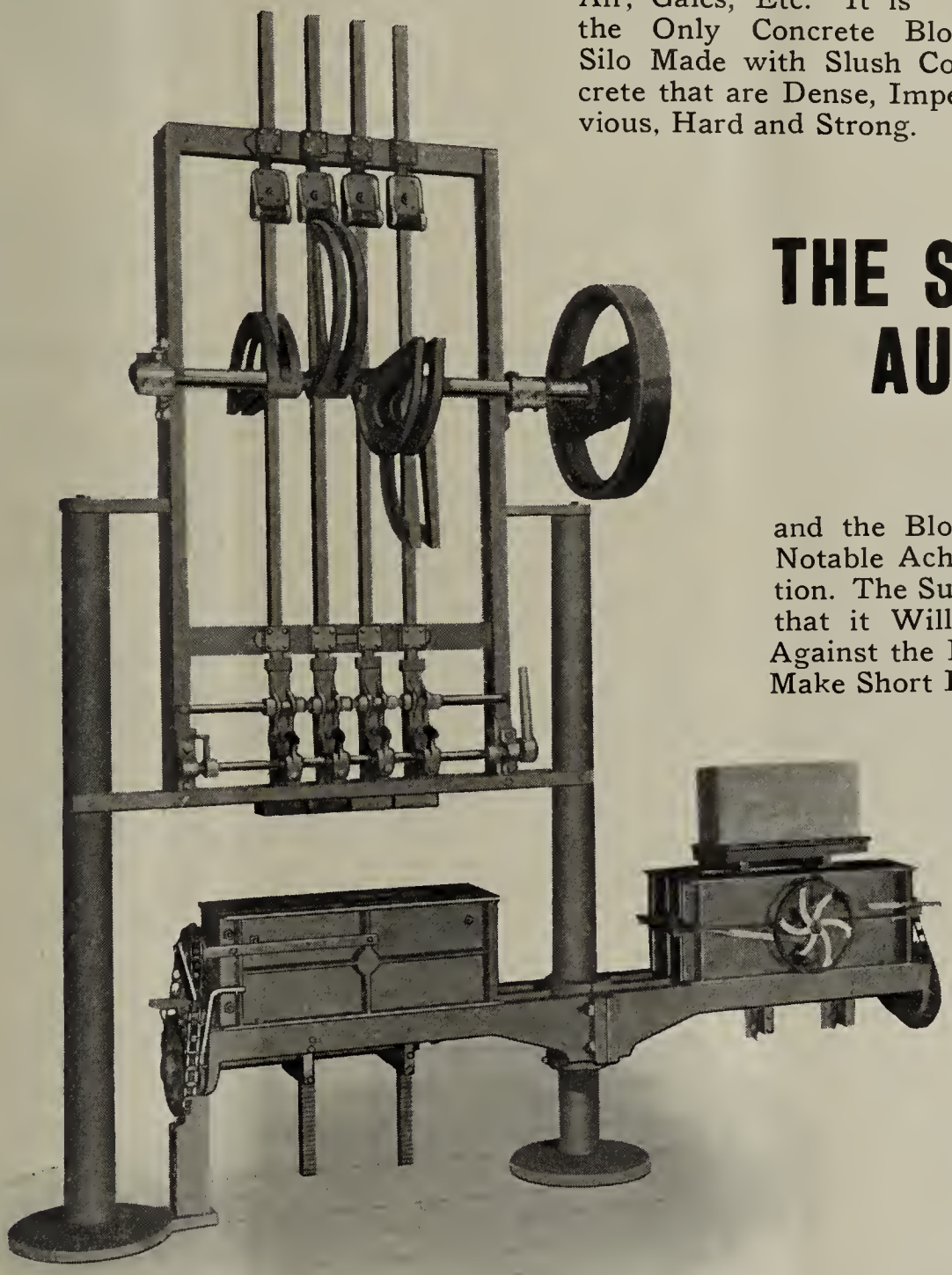
AN OPPORTUNITY FOR
CONCRETE WORKERS AND
PROGRESSIVE BUSINESS MEN.

## At Last! The Perfect Silo



## The Greatest Money-Making Proposition in the Cement Field.

The Greatest Triumph in Silo Construction. The Supreme Result of Many Years Untiring Effort and Exhaustive Investigation Brought to Perfection After Long Scientific Analysis of Ensilage and Studying the Short Comings of All Other Silos. Now the Superior Concrete Block Silo is the Only Practical Silo that Every Agricultural Expert Will Unhesitatingly Indorse. It is the Only One that Absolutely Defies the Destructive Elements of Acids, Storms, Water, Air, Gales, Etc. It is the Only Concrete Block Silo Made with Slush Concrete that are Dense, Impervious, Hard and Strong.

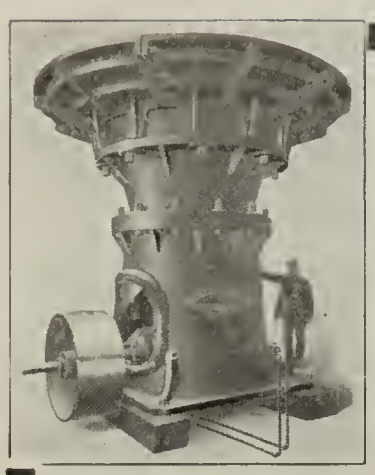


## THE SUPERIOR AUTOMATIC SILO BLOCK MACHINE

and the Blocks Produced Therefrom is the Most Notable Achievement in Silo Design and Construction. The Superior Silo is so Thoroughly Reinforced that it Will Stand Like a Sphinx in the Desert Against the Fierce Attacks of Acids and Gales that Make Short Life of so Many Other Silos. We Have the Greatest Money-Making Proposition for the Wide-Awake Contractor. Three Men Can Make Enough Blocks for a 12x30 Silo in One Day. We Also Manufacture the Miller Silo Steel Door Frame. We Supply Moulds and Pallets to Manufacturers of Our Cement Block. The Superior Machine is in Fact a Double Block Automatic Tamping Machine Which Makes Great Speed in the Making of Cement Block Silos. The Block is Far Superior to the Stave. This is the Best Proposition on the Market and it is Worthy of the Consideration of All Progressive Concrete Men. Here is Where You Can Make Bigger Profits. Machines Leased, Not Sold. Write for Particulars Today.

## Superior Concrete Machine Co.

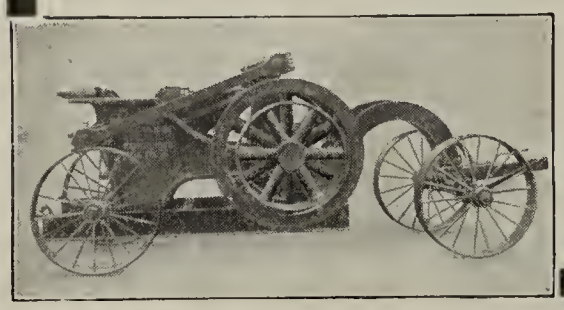
NORTH JUDSON, IND.



AUSTIN Gyratory Crushers are equipped with every exclusive feature which means maximum output in production and minimum expense for maintenance. Made in nine sizes, 50 to 5,000 tons per day. Portable and stationary types.

# ROCK CRUSHERS
## Jaw and Gyratory Types

The Austin Jaw Crusher produces maximum amount of stone with minimum amount of power and is built for severe service over long periods of operation.



236 types and sizes of rock-crushing, road-surfacing and earth-handling machinery.

**AUSTIN MANUFACTURING COMPANY**
CHICAGO — NEW YORK

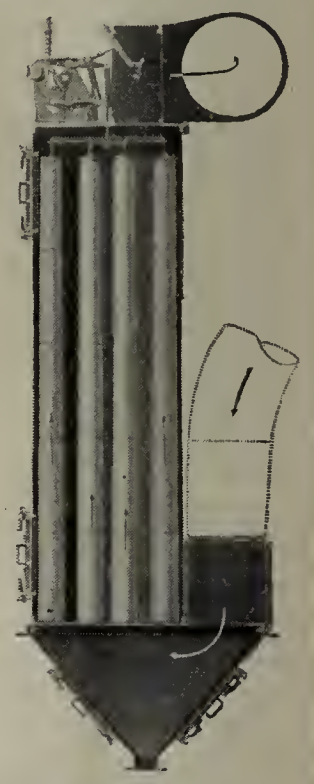
# The Allis-Chalmers Dust Collector

**DUST** *Increases the wear and tear on machinery*

**DUST** *Reduces the efficiency of your plant.*

**DUST** *Is the origin of disease.*

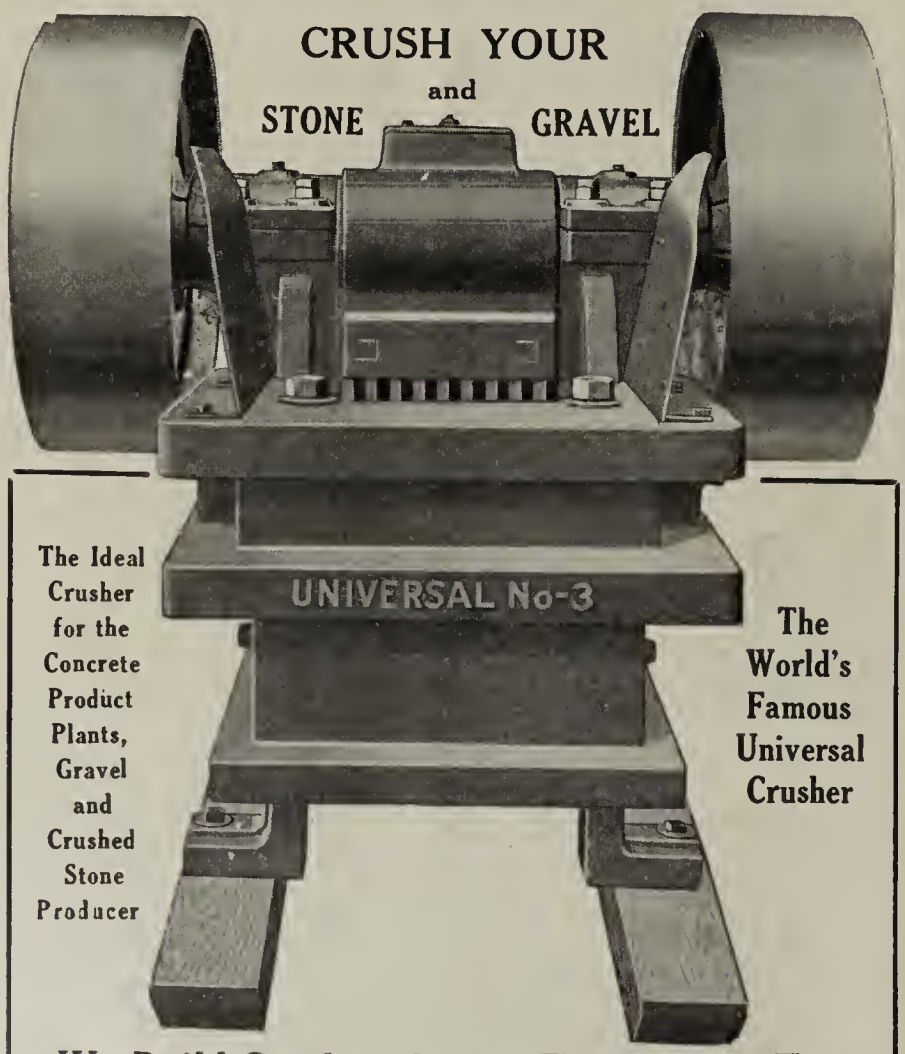
**DUST** *Is the cause of labor difficulties*



*Write for Bulletin No. 1454*

ALLIS-CHALMERS MFG. CO.
MILWAUKEE, WISCONSIN
*Offices in all Principal Cities*

CRUSH YOUR STONE and GRAVEL




The Ideal Crusher for the Concrete Product Plants, Gravel and Crushed Stone Producer

The World's Famous Universal Crusher

*We Build Crushers from 5 Tons to 300 Tons per 10-hour Capacity*

Instantly adjusted to produce size required from ¼ inch to 3 inches. *Write for Folder No. 14.*

UNIVERSAL CRUSHER COMPANY
230 Bee Ave Cedar Rapids, Iowa, U. S. A.

The **Rugged Ruggles**

**AERIAL CARRIER**

Suspended over Slate Quarry

# SELF DUMP BRAK LOCK ING

**Built in Two Sizes:—1 to 5 tons capacity, 5 to 10 tons capacity.**

The **Rugged Ruggles** is made for special use on cement and gravel construction work. For all kinds of quarries where the waste is taken from the pit and dumped at the surface It will take any load up to **ten** tons, from any depth to the cable, where it is automatically released and sent either up or down the cable and dumped in mid-air or lowered. One man can operate three **Rugged Ruggles** on as many cables with a three-drum engine:

**No brake to wear the cable—Can run on a flat cable.**

Simple in construction; made entirely of steel; all the sheaves steel bushed or brass, and is backed by years of extensive use.

**Manufactured by**

**Ruggles Machine Co.,** POULTNEY VERMONT Dept. C

DU PONT AMERICAN INDUSTRIES

# Fire Charges With Electricity

## To Increase the Efficiency of Explosives Reduce the Liability of Accidents and Save Time and Labor.

The use of Blasting Machines enables several shots to be fired simultaneously,—this united action increases the efficiency of explosives.

The location of Blasting Machines in places of safety reduces the liability of accidents.

Several shots can be fired at one performance,—saving the labor and time necessary to detonate single charges.

Ask for Blasting Supplies Catalog. Use the coupon to learn about other DU PONT PRODUCTS.

**E. I. du Pont de Nemours & Co.**

**Powder Makers Since 1802** **Wilmington, Del.**

MAIL THIS COUPON

Marking X Before Subjects of Interest to

**E. I. du Pont de Nemours & Co.**

Adv. Div. (E. I. 112), Wilmington, Del.

- ☐ Blasting Powders
- ☐ Blasting Supplies
- ☐ Industrial Explosives
- ☐ Sporting Powders
- ☐ Trapshooting
- ☐ Gun Clubs
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- ☐ Harrison Paints
- ☐ Flowkote Enamel
- ☐ Flowkote Enamel
- ☐ Auto Finishes
- ☐ Sanitary Wall Finish
- ☐ Antoxide Iron Paint
- ☐ Bridgeport Wood Finish
- ☐ Metal Lacquers
- ☐ Pigment Bases
- ☐ FABRIKOID—Motor
- ☐ " Craftsman
- ☐ " Book-Finish
- ☐ " Sheeting
- ☐ " Truck Special
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- ☐ Fairfield Rub'r Cloth
- ☐ PY-RA-LIN Spec'lt's
- ☐ " Toilet Goods
- ☐ " Sheeting
- ☐ Challenge Collars
- ☐ Com'l Acids
- ☐ Ethers
- ☐ Proxylin Solvents
- ☐ Soluble Cotton
- ☐ Ref'd Fusel Oil
- ☐ Tar Distillates
- ☐ Dyes and Bases

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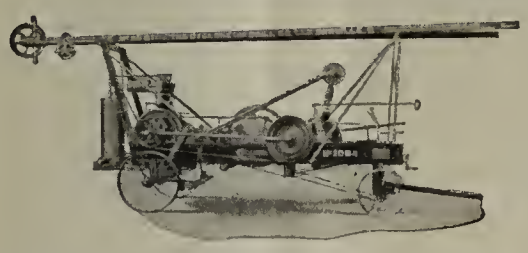
**Note:** When in Atlantic City, visit Du Pont Products Store, Boardwalk and Penna Ave.

**The Du Pont American Industries are:**

E. I. du Pont de Nemours & Co., Wilmington, Del., Explosives.
Du Pont Chemical Works, New York, Pyroxylin and Coal Tar Chemicals.
Du Pont Fabrikoid Co., Wilmington, Del., Leather Substitutes.
The Arlington Works, 725 Broadway, New York, Ivory Py-ra-lin and Cleanable Collars.
Harrison Works, Phila., Pa., Paints, Pigments, Acids, Chemicals.
Du Pont Dye Works, Wilmington, Del., Dyes and Dye Bases.

DU PONT

## A Big Blast-Hole Drill That's Reliable



### The Cyclone No. 14

Heavy, solidly braced frame — Sill timbers 4" x 14". All machinery placed directly on the main sills protecting it against strains and preventing top heaviness. **Eighty per cent (80%) of the castings are cast steel**—not cast iron. The Cyclone No. 14 is the only Blast-Hole drill so built. Furnished in Steam, Gasoline, Compressed Air or Electric Power; traction or non-traction.

**The Sanderson Cyclone Drill Co., Orrville, Ohio**

**Eastern and Export Office, 50 Church St., New York, N. Y.**

BECAUSE WE SPECIALIZE ON

**Lock Seam Pipe** with the smooth inside surface, having already furnished large quantities for Potash Recovery plants, we are able to give especially careful attention to the construction of this class of Pipe.

**Robertson Bros. Mfg. Co., Chicago**

## SOPER ENGINEERING CO.

ELLIS SOPER, PRESIDENT

CHATTANOOGA, TENN.

Designing, Constructing and Operating Engineers and Contractors

Cement Plants and Reinforced Concrete Bridges a Specialty

A CORDEAU-BICKFORD SHOT

54 holes, average depth 92 ft., fired by means of Cordeau-Bickford detonating fuse

# CORDEAU-BICKFORD

**An Instantaneous Detonating Safety Fuse**

## For SAFETY and EFFICIENCY

Particularly adapted to well drill shooting where large columns of explosives are fired, where it is desirable to break the charge in the drill hole, or where a great many holes are to be fired at one time.

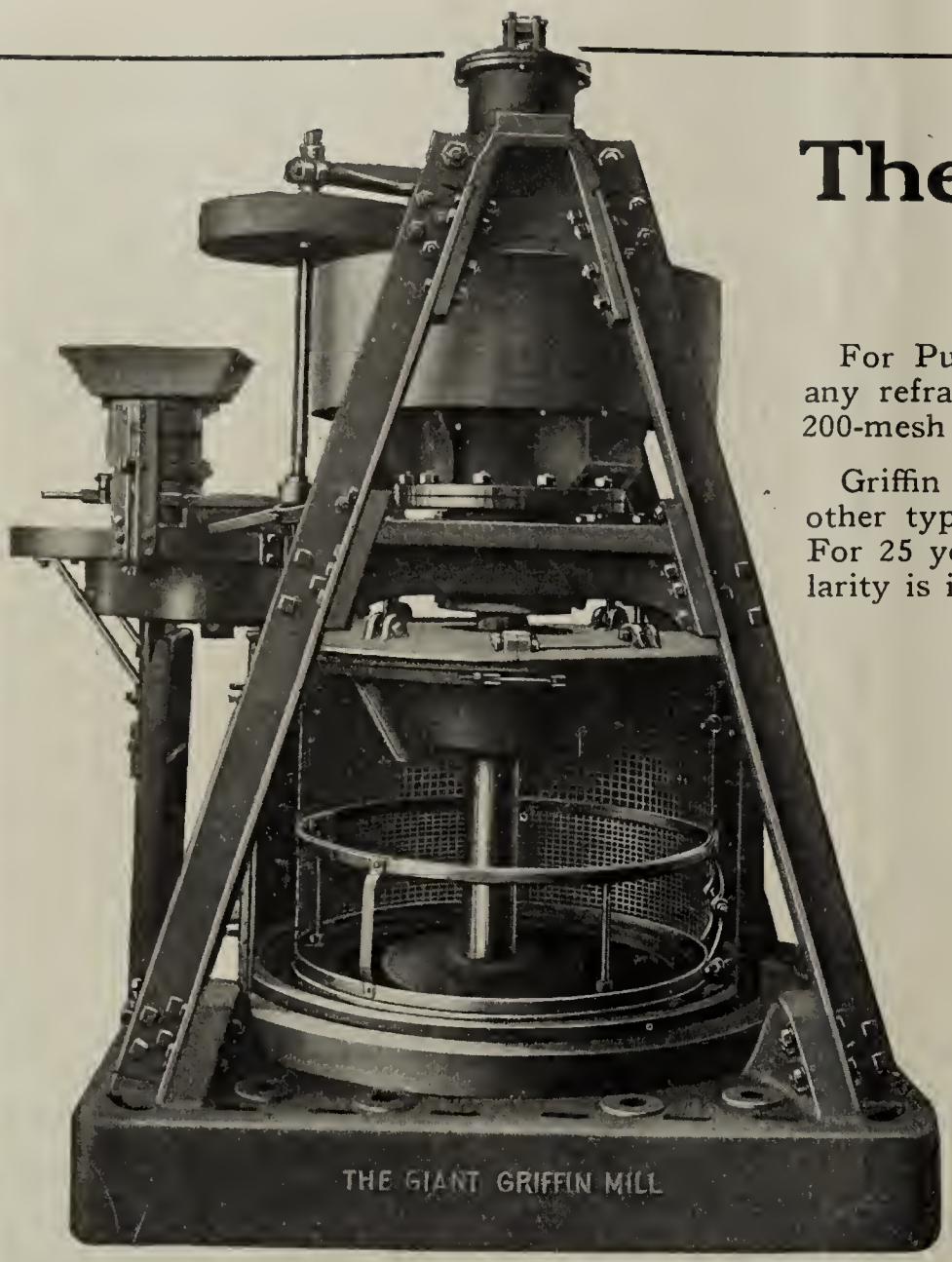
Cordeau is run from the top to the bottom of the drill hole in contact with the explosive charge—one continuous detonator.

RESULTS: Complete detonation, quicker detonation, greater shattering effect, lower secondary costs, substitutes a detonator which is insensitive to shock and friction in place of the electric caps.

*Write for booklets on Cordeau and Deep Well Blasting*

**THE ENSIGN BICKFORD CO., Simsbury, Conn.**

*Original Manufacturers of Safety Fuse* **Established 1836**




# The Improved Giant Griffin Mill

For Pulverizing Coal-Cement Clinker, Raw Material or any refractory material where a finess of 83% through a 200-mesh screen is required.

Griffin Mills are used by Cement Plants more than any other type of pulverizer. Now in operation in 45 plants. For 25 years they have led the procession and their popularity is increasing.

Recent improvements have reduced their former low H. P. and Maintenance Cost to the Minimum. Why not investigate this new Griffin Mill?

Recommended for Agricultural Limestone Producers as well as Cement Producers.

GRINDS ANY DRIED REFRACTORY MATERIAL.

Our Engineers Are at Your Disposal.

## Bradley Pulverizer Co.

**Works Allentown, Pa.**

**BOSTON** **LONDON**

Crushing Plant of the Oklahoma Portland Cement Co., Ada, Oklahoma.

When this Company installed the Traylor 36x72 in. Type C Jaw Crusher, they eliminated unnecessary waste of POWER, LABOR and COSTLY SHUTDOWNS for reasons fully described in Bulletin J1—GET IT.

## TRAYLOR ENGINEERING & MFG. CO.

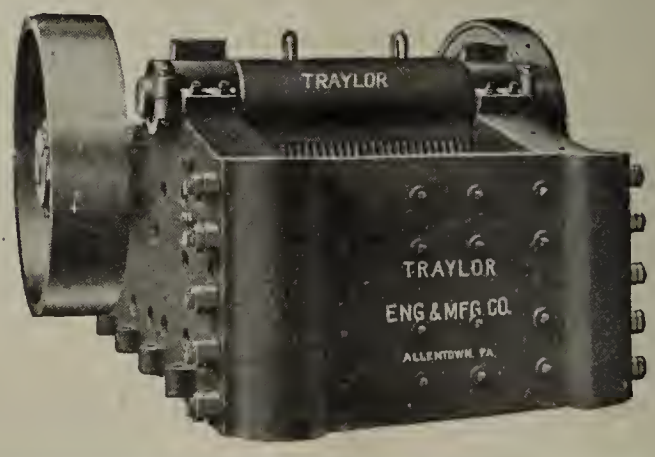
New York Office: 30 CHURCH ST.
Main Office and Works: ALLENTOWN, PA.
Western Office: SALT LAKE CITY
Chicago Office: 1414 FISHER BLDG.

# "IT'S A BEAR"

FOR CRUSHING HUGE PIECES OF STONE WITH EASE AND MINIMUM POWER CONSUMPTION

**THAT'S THE**

# TRAYLOR "TYPE C" Jaw Crusher



# Cement and Engineering News

Vol. 30 March 1918 No. 3

Concrete Helps to Make the Cows Contented

## The Use of Concrete on the Farm

The farmers throughout the country are realizing that cement can be used for various purposes and are using more and more of it each year. It makes fine feeding troughs, watering troughs, barn floors, and concrete floors for the pigpens are becoming popular in certain sections of the country and the farmers declare that it is a real feed saver. "You see," said one gentleman who had made a study of the matter, "well fed hogs are becoming choice in the matter of eating and they eat the clean corn but will not root around in the mud to find the dirty corn. No, sir; the hogs are becoming smart; they will simply wait until the farmer comes around with more feed. Concrete floorings save from 30 to 40 per cent of feed.

# CEMENT AND ENGINEERING NEWS

(PUBLISHED MONTHLY)

**WILLIAM SEAFERT, Editor and Publisher**

Office—672 Transportation Building, Chicago

Telephone, Harrison 5397 Cable Address, "Seaferts" Chicago

Entered at the Post Offfce at Chicago, as second-class matter, July 21, 1896 under Act of March 3, 1879

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Advertising copy or changes in ads. must be in this office by the 25th of each month, as hereafter our magazine will appear on the 5th of the following month

Advertising Rates Sent on Application

JOHN F. WALDRON - - - - - - - - Advertising Manager

CHICAGO, MARCH, 1918


## More Concrete Work than Ever this Spring

For various reasons many plants all over the country were forced to be idle during the last winter. Railroad congestion and coal shortage compelled the Eastern factories to stop working either entirely or often only part of the time, while trade in the Middle West was tied up mainly by unprecedented snow-fall. The Western States were likewise involved inasmuch as they had to supply the East with raw materials or half-finished products, the shipment of which was frequently canceled or ordered to be postponed.

Spring has returned, the hardships of the past are forgotten and every manufacturer takes a hopeful view of business conditions. To what extent this is true can best be realized on a trip through the country. Everywhere building is going on. In many instances plants may be found to be shut down, and only repair crews left at work, but at the same time, the company will be seen to be planning new construction and making use of the enforced idleness in order to be prepared even on a larger scale than before for orders that have necessarily to pour in, as every factory and establishment will be taxed to the utmost in contributing their share in the gigantic struggle going on.

All over the country, gravel and stone are being hauled to the factory site in order to lay the foundation for such additional work and mostly to do a great deal more, namely to construct entire factories, office buildings and dwellings.

Also concrete roads are being built on an ever increasing scale, in order to facilitate the haul to the plant and to the railroad and thus to save time and expense, which is equivalent to a decrease in the cost of production.

## Road Building Now an Engineers Job

Railroad managers have had the foresight to reduce grades, build permanent, well drained road beds and to lay heavier rails as the weight of traffic increased, knowing that by thus reducing resistance to easy motion a greater tonnage could be hauled at higher speed with less power. Dividends are wrapped up in these three points: increased tonnage, speed in movement, and reduction of fuel cost. Right at this point—reducing resistance to easy motion—is where either gain or loss comes in, and this principle applies to the country road equally as well as to the railroad.

Railroad managers have done this work so well that the cost of hauling freight has been reduced to considerable less than 1 cent per ton mile, making railroad operation profitable, while on the country road, failure to remove resistance to easy motion makes the cost of hauling range anywhere from 25 to 35 cents per ton mile. A recent report by the U. S. Office of Public Roads places the average cost of hauling on a country road at 23 cents per ton mile. The cost of hauling on a country road after it has been properly rebuilt or paved has been found to be about 9 cents per ton mile.

In view of these facts it is very clear that road building in the United States is now an engineer's job, and not a mere matter of a few teams and plows and scrapers four or five days in the year.

## A Record Silo Year

This year will set a new high record in the matter of concrete silo construction. Whether the monolithic, the stave, or concrete block types are employed, the demand is the same. The increasing appreciation of the soil among farmers has also served to demonstrate the fallacy of the wood stave, metal, or clay products silos. We venture to say that now there is not an owner of any of these latter types of silos who is not wondering why the concrete silo was not selected. This, then, is the time to "sound" the farmer on silos. The farmer who is still without one has absolutely no grounds for evasion. The farmer who has other than a concrete silo is pretty nearly ready to talk concrete. And here is the important point for the cement man—no more profitable work can he find to keep him busy all season than can be found in silo construction.

## Build More Highways and Build Them Promptly!

More highways, more highways and better highways must be built and existing highways improved in order to strengthen the nation in the great world contest which it must face for several years to come.

Every day proves that the country must largely depend upon motor trucks and automobiles for a vast amount of travel and freight traffic. The railroads are wholly unequal to the business. Traffic will grow more rapidly than the railroad facilities, even under Government domination, can be expanded. Highways must be improved in all parts of the country and motor trucks and automobiles must come in larger use to help overcome the breakdown of the railway system.

"Build more highways and build them promptly," even at the expense of tens of millions, or of hundreds of millions, if necessary, must be the order of the day, or else the nation will be tremendously handicapped in this great contest.

# A Concrete Roadway System in a Shop Yard

## Description of the New Concrete Walks built by the Santa Fe in Storehouse and Shops in Topeka.

By Charles E. Parks.*

In order to facilitate the handling of material and supplies in the shop yards of the Atchison, Topeka & Santa Fe at Topeka, Kan., this company has constructed approximately two and one-half miles of concrete roadways connecting all the principal shop buildings, warehouses, storehouses, lumber yards, car sheds and unloading and storage platforms within the shop enclosure. The Topeka shops of the Santa Fe cover 120 acres of ground and are the largest on the system, containing all the principal repair shops of the company for the repairing and manufacturing of all classes of equipment and also the main storehouses and storage platforms, lumber yards, etc.

Prior to the construction of these concrete roads the trucking and hauling of all storehouse supplies to and from the storehouses and shops and the transporting of material between the different shops was done by teams under contract and by electric trucks over dirt and cinder pathways. Much hauling also was done by push-cars and switch engines. However, all of these methods were costly expedients.

The cinder roads had been built to permit the operation of power-propelled vehicles in order to displace the slow and expensive handling by ordinary hand trucks. However, they did not prove entirely successful, as only a small percentage of the traction power of the electric trucks in service could be utilized, even when the roads were in good condition. At times they were impassable for the trucks, resulting in great inconvenience and delay. The hauling by switch engines of material in box cars was necessarily costly, particularly when it was necessary to handle a car three or more times, resulting in heavy switching charges, delay to cars and other expense connected with the intermittent moving and unloading.

Before the construction of concrete roadways was finally authorized an exhaustive study of hauling and trucking conditions was made. This study included a series of tests with an electric truck, the object being to determine the difference in power necessary to start and pull a loaded truck with and without trailers over earth, oiled cinders, wood, metal and concrete roadways.

### The Test Conditions

The electric truck used in these tests had a capacity of 4,000 lbs. and weighed 2,220 lbs. It was equipped with rubber tired wheels 15½ inches in diameter and a 3-in. tread. The battery of the truck consisted of 24 cells, Edison Type A-6, showing 31 volts at a normal discharge of 45 amperes, or about 1.2 volts per cell.

The trailers referred to in the table as Nos. 1, 3 and 4 weighed 385 lbs.; trailer No. 2 weighed 401 lbs. and differed from the others in that it had ball bearings in the pedestal wheel pivots and roller bearings in the rear wheels. The diameter of the front wheels of all the trailers was 8½ in. with a 2½-in. tread, while the rear wheels were 18 in. in diameter with a 3½-in. tread.

The power used by the truck was indicated by volt and ammeter readings obtained by volt and ammeters placed on the truck. The pull required to move the trailers was determined by placing traction dynamometers between the truck and the different trailers. Before testing, the truck and trailers were each loaded with ten kegs of bolts and nuts, making a 2,000-lb. load on each.

**A Converted Ford Truck Hauling Trailers Loaded with Heavy Materials**

Test No. 1 was made with the unloaded truck and the trailer loaded with 2,000 lbs. of bolts and nuts on a cinder road. To start the truck required 600 lbs. of tractive force, and to keep it moving at a speed of three miles an hour required 250 lbs. of tractive force. It was necessary to give some assistance to the truck in starting, the wheels slipped badly and it did not handle the load satisfactorily.

Test No. 2 was made with the unloaded truck and trailer No. 2 loaded with 2,000 lbs. of bolts and nuts. This was the roller bearing trailer and it required 500 lbs. of tractive force to start the truck from rest and 225 lbs. to keep it moving at a speed of three miles an hour. As the truck was empty it did not handle the load satisfactorily.

*In January 11 issue Railway Age Gazette.

Test No. 3 was made with the truck loaded with 2,000 lbs. of bolts and nuts, and trailer No. 1, with a similar load, on a cinder road. This road was level and the cinders oiled, the same conditions prevailing in conducting tests Nos. 1 and 2. The tractive force necessary to start the load from rest was 600 lbs. and to keep it moving at a speed of three miles an hour, 250 lbs. The truck handled the trailer without slipping, but it tended to stall several times after starting, indicating that 4,000 lbs. net weight was the maximum load which it could handle on the cinder road.

Test No. 4 was similar to No. 3, with the exception that trailer No: 2 was substituted for trailer No. 1. It required a tractive force of 500 lbs. to start the load and 225 lbs. to keep it moving, the difference being due to the roller bearings in the trailer.

In test No. 5 trailers Nos. 1 and 2 were attached to the empty truck, but it could not move the load on the cinder road.

Test No. 6 was similar to No. 5 with the exception that the truck was loaded with 2,000 lbs. of bolts and nuts. However, the load could not be moved, proving that the former conclusions that 4,000 lbs. was the maximum load which the truck could handle on a cinder road was correct.

Test No. 7 was conducted on a level concrete road with the loaded truck, to which was attached the four loaded trailers. The tractive force necessary to start this load from rest was 800 lbs. and to keep it moving at a speed of three miles an hour required 250 lbs. The 10,000 lbs. net weight was moved satisfactorily with about one-half the power used to move 4,000 lbs. over the cinder roadway. The ammeter reading in this test was 103 to start and 72 to pull; volts, 22 to start and 26 to pull. In test No. 3 the ammeter readings were 220 to start and 160 to pull; volts, 22 to start and 26 to pull.

Test No. 8 was conducted on a 10 per cent concrete grade 40 feet long. Trailer No. 1 was attached to the loaded truck and started up the grade, but it stalled when halfway up. The ammeter reading was 200 just as the motor stalled, and the volts 12.

In test No. 9 the loaded truck was started up the 10 per cent concrete grade alone. It moved up satisfactorily with its 2,000-lb. load. The ampere reading was 140, volts 18.

The remaining tests were made with single trailers to determine the pull necessary for handling them. This was determined by pulling them by hand, using a spring balance to register the pull. Trailer No. 1, having common bearings, and trailer No. 2, having roller bearings, were used in the tests which were conducted on concrete, wood and metal roadways. A comparison of the tractive force necessary to start and pull these trailers is shown on the table.

The following table gives a summary of the results obtained in the tests conducted.

SUMMARY OF TRACTIVE FORCE NECESSARY TO START AND PULL TRUCK AND TRAILERS IN THE TESTS DESCRIBED IN THE TEXT

| Test No. | Road | Load on truck in lb. | Attached loaded trailers | Tractive force in pounds: Start | Tractive force in pounds: Pull |
|---|---|---|---|---|---|
| 1 | Cinder | ..... | No. 1 | 600 | 250 |
| 2 | Cinder | ..... | No. 2 | 500 | 225 |
| 3 | Cinder | 2,000 | No. 1 | 600 | 250 |
| 4 | Cinder | 2,000 | No. 2 | 500 | 225 |
| 5 | Cinder | ..... | No. 1 & 2 | Could not start load | |
| 6 | Cinder | 2,000 | No. 1 & 2 | Could not start load | |
| 7 | Concrete | 2,000 | No. 1, 2, 3 & 4 | 800 | 250 |
| 8 | Concrete | 2,000 | No. 1 | Stalled when halfway up | |
| 9 | Concrete | 2,000 | None | Pulled up satisfactorily | |
| 10 | Concrete | Hand power | No. 1 | 90 | 35 |
| 11 | Concrete | Hand power | No. 2 | 60 | 30 |
| 12 | Wood | Hand power | No. 1 | 165 | 85 |
| 13 | Wood | Hand-power | No. 2 | 120 | 60 |
| 14 | Metal | Hand power | No. 1 | 95 | 45 |
| 15 | Metal | Hand power | No. 2 | 85 | 35 |

**Dynamometer Test with an Electric Truck on a Cinder Road. Dynamometer on Drawbar and Volt and Ammeter on Truck**

The following table shows the power used by the truck in conducting the various tests:

VOLT AMMETER READINGS

| Test No. | Road | Attached loaded trailer | Volts: Start | Volts: Pull | Amperes: Start | Amperes: Pull |
|---|---|---|---|---|---|---|
| 3 | Cinder level | No. 1 | 22 | 26 | 220 | 160 |
| 4 | Cinder level | No. 2 | 22 | 26 | 220 | 160 |
| 7 | Concrete level | No. 1, 2, 3, 4 | 22 | 26 | 103 | 72 |
| 8 | Concrete 10% grade | No. 1 | .. | 12* | .. | *200 |
| 9 | Concrete 10% grade | None | .. | 18 | .. | 140 |

* Readings taken just as motor stalled.

## Results

These tests indicated the great advantage of concrete over cinder roads. On the latter the small front pivoted pedestal wheels of the trailers dug into the road, requiring heavy starting effort. This was especially true when the load was turning. Even on tangents the load presses these small wheels a considerable distance into the road so that they tend to slide rather than roll, requiring more power to pull the trailers on cinders than on concrete. This difference is seen by comparing tests Nos. 3 and 4 with No. 7, where it took less power at the motor and also less pull at the drawbar to move the loaded truck and four loaded trailers on concrete than it did to move the loaded truck and one

trailer on the cinder road. This was shown more strikingly when it was observed that it took a steady pull of 225 to 250 lbs. to handle one trailer on the cinder road and only 30 to 35 lbs. to handle it on the concrete floor. Comparing trailer No. 1, which has common bearings and trailer No. 2, which has roller bearings, the data show that it takes approximately 20 per cent more power to start and pull the former than it does the latter.

**Electric Truck Hauling Six Trailers Loaded with 17,500 lb. of Brass**

The final result of these tests showed that an electric truck could handle only a small percentage of its full tonnage when used on dirt or cinder roads, even when these roads were in good condition, and clearly indicated the great advantage of concrete roads over wood, metal and especially oiled cinders, the truck handling four to five times as large a load at a smaller power output on the concrete roads than on the latter.

### Concrete Highways

In view of these conclusions the Santa Fe decided that greater economy would be effected by building a system of concrete roads on the shop and storehouse premises. Accordingly, 12,979 feet of these roads were constructed, practically surrounding the yard and connecting all the principal buildings, storage areas and unloading platforms.

These highways vary in width from 5 to 12 feet, 10,708 square yards being of 12-foot width and 3,490 square yards of 5, 6, 8 and 10-foot widths, a total of 14,198 square yards of concrete being used. In addition, 89 railroad crossings—71 12 feet wide and 18 less than 12 feet—were bridged. In connection with the work 300 feet of new track was laid and 1,627 feet taken up.

In constructing the roadways, the line and grade

**Automobile Truck Carrying 6,000 lb. of Cement**

were first established and the side forms, consisting of 2-in. by 6-in. wooden strips placed in position. As many of these roads took the same course as the cinder roads which had been in use previously, there already existed a firm subgrade which required no tamping. However, this was dressed carefully and 2,400 cubic yards of excavation outside of the track crossings was removed, the surplus dirt being thrown out and where possible used against the shoulder. The balance was carted away.

The roads are of one-course concrete construction throughout, 6 in. in thickness at the edges, with a slight crown (about ½ in.) in the center which varies with the width. The track crossings are constructed with 12 in. of concrete under the ties upon which is placed a sand cushion. The concrete is then paved with brick to the end of the ties. On account of the small wheels of the trucks and trailers used in hauling material at the shops it was desirable to have a small flangeway between the rails and the roadway in order to lessen as much as possible the jar incident to crossing, so the flangeways are on the average 1¾ in. wide. On the main line crossings they are made by using angle irons of ⅜-in. by 2½-in. by 2½-in. section, the bottom leg resting upon the concrete blocking and the outer edge against the web of the rail. The angle bar is drifted to the ties by bolts driven through holes drilled in the lower leg. On side track crossings, the construction is wholly of concrete. After the angle irons for the flangeways have been anchored the concrete is run to a surface even with the top of the rails. Angle irons also are imbedded in the concrete on the sides and termini of the roads at places where the concrete is liable to be injured by constant trucking to and from shop buildings.

Expansion joints are placed every 30 feet. Between these are placed two strips of tarred paper, held in place by steel plates which were removed when the concrete had been placed 10 feet in advance of the joint. The 12-foot roads are reinforced with ¾-in. rods placed along each side and running the entire length of the roads and ¾-in. bars placed crosswise every 30 feet, or at the ends of each expansion joint. The roads 10 feet or less in width are not reinforced. Standard portland cement meeting the specifications of the American Society of Testing Materials was used in the work, the fine aggregate being clear sharp sand taken from the Kaw river near Topeka, and the course aggregate consisting of clean crusher-run Garnett stone of 1½-in. maximum size from which all the fine screenings had been removed. In mixing the concrete the time was 1½ minutes, and the concrete was delivered direct from the mixing machine to the roadway and leveled.

Before the concrete set a common painter's brush was used to give the top of the road a smooth surface, or where rough spots existed, a wooden float was used to smooth it out. The finished roadway was then covered with dirt and water for curing and left covered in this manner for 21 days. The work was done entirely by company forces under the supervision of W. C. Hunt, traveling storekeeper.

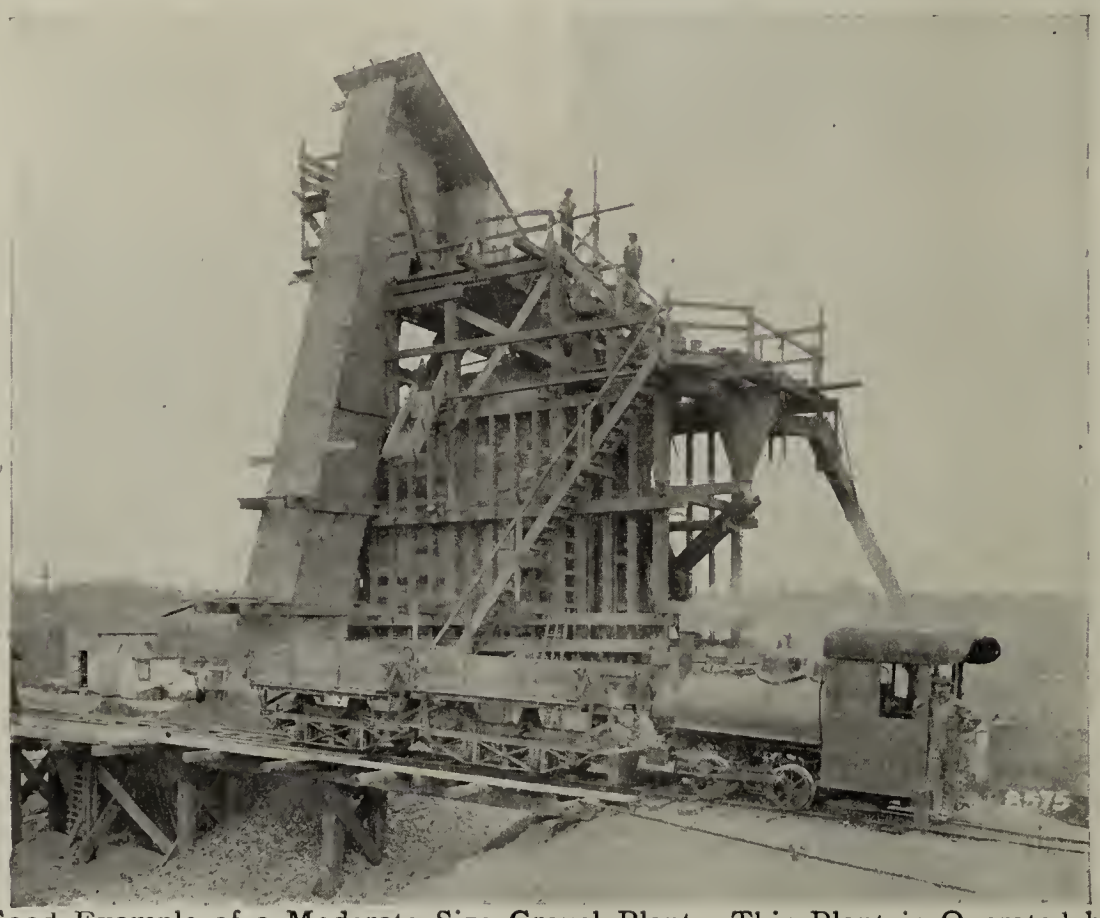
These roads have been in service for several months and are giving satisfactory service. They are made use of by electric trucks and trailers, hand trucks, horse-drawn vehicles, automobile trucks and trailers and by pedestrians, and are the principal factor in the economical distribution of materials to the various shops and storage yards.

### Electric Trucks

The electric trucks in use are Class A-1, manufactured by the Buda Company, Chicago, while the gasoline trucks are Ford chassis cut down to 40 in. in

width and geared as low as possible. For heavy work three-ton White trucks are used.

Electric trucks are much more flexible for the handling of platform storehouse material and car work than the gasoline truck as developed thus far. The former will turn in a shorter space, can be driven backward or forward more promptly, and can handle trailers into cars and on platforms with much greater ease, but they are not so well adapted for straight hauls of considerable length. The gasoline trucks can haul bolsters and frames, car bolts, driving boxes and similar material from the storage platform to the point of use, from one-half to two miles distant, with greater facility than the electric trucks. The White trucks are very economical in handling heavy material in carload lots and have released for service at these shops alone about three cars a day, which otherwise would have been tied up from three to six days in switching.



Good Example of a Moderate Size Gravel Plant. This Plant is Operated by an Electric Motor and General Design and Operation Is an Economical One from All Points of View.

## Good Example of a Moderate Size Gravel Plant

The sand and gravel washery of the Raritan Ridge Clay Company of Metuchen, N. J., is a good example of the moderate size plant; with machinery to handle 50 yards of material per hour, and deliver clean sized product direct to railroad cars. The material is fed with a steam shovel, delivered to narrow gauge cars, and by them dumped into a large hopper feeding the double chain elevator. This elevator is of the low-speed double-strand type with malleable iron buckets. stream of water for carrying along and washing the material is introduced into the chute leading from this elevator and carries the product into the first of two Gilbert type conical screens. This screen takes out the larger stones and delivers the other size to a second screen with smaller holes, which separates the smaller size of gravel from the sand. The sand and water then pass down a flume to two automatic counter-weighted settling tanks or separator boxes, which take the muddy water out of the sand, and deliver the sand to railroad cars.

The illustration shows the right-hand one of the two sand settling tanks hanging from the upper frame, and also shows the overflow flume on the right-hand side of the tank, leading the dirty water off to the field or sump.

This plant is operated by an electric motor, and the general design and operation is an economical one from all points of view.

The amount of room occupied by the plant is small, and the maintenance of this kind of machinery low, as the chains of the double-strand elevator are equipped with case-hardened pins and bushings and run over chilled sprocket wheels. These features in connection with the low speed of the moving parts insure long life to elevator and machinery. A gasoline-engine-driven pump supplies the water to the upper flumes and chute, through a 4-in. pipe, and has proven entirely satisfactory for the work.

The under works of the bin are built of concrete which is the right construction for a bin holding wet material, for if otherwise supported, the constant streaming and leak of water would make necessary the replacement from time to time of any under-timbers used. This is entirely eliminated by the use of the concrete walls as shown in the cut.

The elevator is enclosed in a wooden casing to avoid the possibility of sand or an occasional falling stone reaching the head of the "Innocent Bystander."

A plant of this type with comparatively small bin capacity is most practical when the supply of railroad cars is regular from day to day, which enables the machinery to run at full capacity without much storage room.

The machinery was designed and built at the Philadelphia plant of the Link-Belt Company.

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## Kansas Cement Plant Resumes Operation

The Fredonia Portland Cement company, Fredonia, Kansas, resumed operations again after having had the greater part of the plant shut down for some time on account of shortage of coal and being unable to get cars to fill orders. During the shut-down, repairs have been made, and by tomorrow morning it is expected to have a full force of men working.

# *Ten Miles of Concrete Pipe*

The lower 10 miles of the long Winnipeg Aqueduct, that is the section under pressure which connects the flow line with the city mains, is to be of 5½ft. reinforced-concrete jointed pipe laid in a trench from 14 to 16 ft. deep. All of the pipe, about 6,600 in all—for they are cast in 8-ft. lengths—are made in a yard about midway of the line, where a duplicate layout permits rapid pipe manufacture. From this yard the pipes are transported to the trench on a paralleling railway and are put in place by simple but effective machines. The work was started last spring and progressed favorably up to cold weather this winter. This article describes the manufacturing and laying operations.

This line of pipe is circular, 66 in. in internal diameter, with a wall thickness of 8 in. It is reinforced with two concentric steel cages, spaced 2 in. from the inner and outer surfaces, respectively. The inner reinforcing cage is built up of a specially heavy woven section of the American Steel & Wire Co.'s triangular mesh and the outer cages of ½-in. to ⅝-in. square twisted bars, the spacing and size varying with the 45 to 90-ft. head. The mesh, having a constant area, is supplemented where necessary by hard-drawn round rods from No. 4 to $\frac{7}{16}$ in., this reinforcement varying with the amount of backfill and other conditions of external loading, as when passing under highways and railroads.

On account of the depth to which frost penetrates in this locality there is a minimum cover of 6 ft. of earth over the top of the pipe, and the trench is therefore of an average depth of 14 to 16 ft. Heavy blue and yellow clay predominates, and in taking out this excavation a double row of round piling on 11-ft. centers was first driven with the tops flush with the ground. The piles in each row are placed on from 2 to 4 ft. centers and in length averaged about 20 ft. A 40-ton steam shovel carried on movable sectional timber mats resting on the pile tops was used in taking out the cut, the bottom being trimmed by hand.

The foundation for the pipe consists of 7 in. of coarse back-run gravel spread evenly over the trench bottom. After the pipe is laid, vertical form boards are carried almost to the spring line and a concrete cradle is poured on both sides of the pipe. Coarse gravel backfill is carried to the spring line after the form boards are removed, and a tamped backfill of clay is carried to one foot above the top of the pipe. After the joints are poured the complete backfill is made by drag-line scrapers.

After the tamped backfill is completed and before the joints are poured, a pile puller straddling the trench removes the piles, and they are moved ahead to be redriven. The pile holes are carefully filled with tamped gravel as soon as piles are pulled.

A vitrified drain pipe is carried on one side of the trench for its entire length and finally discharges into the Red River. This tile is between the cradle and the trench side and ground water entering the opposite side of the trench is expected to find its way to this tile by means of the coarse gravel bed.

The entire contract was undertaken by the Winnipeg Aqueduct Construction Co., who subcontracted the manufacturing, laying and jointing of this pipe to the Canada Lock Joint Pipe Co., Ltd., whose design of joint had been accepted by the Greater Winnipeg Water District at the time of awarding the contract

The Canada Lock Joint Pipe Co., Ltd., erected a manufacturing plant near Transcona on the Canadian Government Railways, at a point almost midway of the line to be built and distant about one mile. This plant occupies about fifteen acres and is provided with railroad tracks connecting both with the Canadian Government Railways and the line which parallels the trench.

An 8-ft.-gage track, 1,075 ft. long, is laid through the center of this yard, to care for two double cantilever cranes which handle all concrete to the pipe molds as well as place all reinforcement after it is built up. These cranes also place and strip the forms and place the pipe on the skidways after it is sufficiently cured to permit handling. A view of one of the cranes is shown in one of the views herewith.

Parallel to this track on each side are 144 concrete slabs to provide a firm foundation for the cast-iron base forms, of which there are also 144. These concrete bases are each provided with five steam jets, one at the center and four on the outside, which in turn are connected through a valve with a steam line fed by two 60-hp. locomotive-type boilers. Canvas covers are provided which enable the pipe to be subjected to a mild moist steam for 48 hours, in order to accelerate the setting.

At each end of the crane track are two pits to receive the 1¼-yd. conical concrete buckets, which are each fed by two 10-cu.ft. Jaeger mixers, gasoline driven. Behind each bank of four mixers are two elevated tracks from which the aggregate is dumped to tight platforms from side dump cars. Storage is provided for 3,000 cu.yd. of aggregate. The mixers are charged with wheelbarrows working from the face of these material bins. Water and steam lines are led to the mixers, and also perforated steam lines are laid under the aggregate in order that concreting materials may be warmed in cold weather.

The pipe is made in 8-ft. lengths, and 36 forms are provided, giving a daily capacity of 288 lin.ft. of pipe; and, as there are 144 cast-iron bases, it is possible to leave the pipe four days after pouring before tipping and placing on skidways. Each 8-ft. section of pipe weighs approximately 17,000 pounds.

Parallel to the center crane track and 100 ft. distant on each side is a standard-gage track where, by means of a car derrick, the pipe is loaded to cars for transporting to the trench. Each end of the yard is an exact duplicate of the other, and while the crane and mixer crew is concreting 18 pipe, the other crane is setting up at the other end, after which operations are reversed. Four fabrication yards are provided, two for mesh and two for bar cages. Here, by means of rolls and special mandrels, the cages are built up and rolled to position for cranes to pick up and place on the forms. Shops, storehouses for cement, etc., as well as accommodations for the men, are provided.

The aggregate as furnished by the Greater Winnipeg Water District contains approximately 42% sand and 58% gravel of a maximum size of 1½ in. Approximately 1.9 bbl. of cement are used per cubic yard of concrete. The daily output of the plant calls for 136 cu.yd. of concrete, 270 bbl. of cement and 15 tons of steel.

Parallel to the trench for its entire length is a standard-gage railroad, over which pipe, gravel, cement and other material are delivered to the site of the work.

**Boom Derrick on Caterpillar Transfers Pipe from Railway to Trench Dug by Steam Shovel Traveling on Sectional Mats**

A crane of 10 tons capacity having a caterpillar traction is provided to take pipe from the car and place it in the trench. It is shown at work in one of the views. The laying machine consists of a four-wheel truck of standard gage and 15-ft. wheel centers, on which is mounted a 20-ft. beam pivoted over the front set of trucks. The extension of this beam carries a 4-ft. timber given a wide movement by a ball and socket joint, while the other end is connected through an A-frame and suitable sheaves to a three-ton chain hoist. Under the pivot point of beam is a ratchet slide giving cross movement. Concrete counterweights on the rear of the truck permit of the pipe being balanced on the end of the beam and moved ahead to enter its spigot accurately into the bell of the one previously laid. This laying rig runs in the trench on a track of 20-lb. rails in 10-ft. lengths mounted on 3x10-in. timbers. Opposite rails are held to gage by bridle rods easily removable to permit pipe to be laid between rails, which are then taken up and moved back. As

**Cantilever Crane Carries Concrete Buckets from Mixers in Foreground to Pipe Being Cast**

many as 30 pipe or 240 ft. per ten-hour day have been placed by this method.

After the pipes are joined the space between shoulders is pointed up with a stiff mortar, whose function is to prevent dirt or ground water entering the joint recess before the joint is made and also to retain the grout while pouring the joint.

As previously mentioned, the joint is not poured until the backfill is brought up to one foot above the top of pipe and the piles are pulled, as it is desirable that final settlement or displacement, if any, take place while the individual lengths of pipe are free to move without injury to the joint.

After each length of pipe is correctly placed to line and grade a hole about 4 in. square is broken out of the bell to serve later as a means of introducing the joint grout. This hole is temporarily covered with a piece of roofing paper and held in place by a small amount of mortar.

There is placed in the spigot of the pipe when manufactured an endless copper band 5 in. wide, having a closed bead rolled into it 1½ in. from one edge. This copper water stop is so placed that the bead is just at the end of the spigot, leaving 1½ in. of copper protruding. The outside end of the spigot is painted with a thin asphaltic coat to prevent the grout joint or key from bonding to the pipe itself, although the copper is roughened to insure this key being firmly gripped by the grout, which is also bonded to the bell end of the other pipe by means of the protruding mesh, as in the Meriwether lock joint.

After the backfill has been placed for a sufficient time to insure all final settlement having taken place, the joint recess is carefully cleaned out and wetted, and a steel sealing band or form is closely fitted to the inside of the pipe, lapping over the joint recess. The cover over the hole previously broken in the top of the joint is then removed, and the recess filled with a 1:1 mortar. After hardening properly, the forms are removed, and the joint is scraped and roughened to receive properly the secondary joint.

The poured or primary joints are not brought out to the surface of the pipe, but are recessed $\frac{3}{16}$ in. and this recess is later filled and a continuous smooth surface formed by a plaster coat of neat cement, specially ground to pass a 200-mesh screen.

Laying has been carried out on two points, and the equipment above described has been duplicated.

This contract approximates $1,350,000 in cash and is to be completed on Oct. 31, 1918. Work was commenced on the construction of plant and railroads in March of this year, and in spite of a very early close down this fall on account of cold weather, approximately 45% has been completed. J. H. Fuertes is consulting engineer and W. G. Chace is chief engineer for the Greater Winnipeg Water District.

## Link-Belt Products Described

"The wise use of lubricant is one of the best practices in any machine shop or factory." This sentence, taken from the introduction to book No. 342 of the Link-Belt Company, Chicago, concerning its silent chain drives, is a volume in itself, as is also the following paragraph: "It is a principle of practical mechanics that any chain drive will last longer and require less attention if it operates through an oil bath in a tight casing, than if it runs exposed, with little or no oil." The illustrations in the book show the workings of the belt drives in the casings and also their exterior appearance in connection with machinery. Book No. 246 of the same company relates to the Link-Belt electric hoists, which it says are designed and constructed for hard and continuous use within their rated maximum capacity.

## Care of Conveyor Belts

The life of a conveyor belt can be greatly prolonged if adequate attention is given to the belt, the idlers and the general operating conditions.

If the idlers are not kept thoroughly lubricated they will not turn freely, and will cause undue abrasion on the bottom rubber cover and additional strain in the duck.

It is always advisable to install a decking or covering between the troughing and return idlers, for, without it, a piece of material falling from the upper strand of belt may be carried by the lower strand to the end pulley, and there squeezed between the pulley and the belt. A puncture in the rubber cover may result, and moisture penetrating the opening will rot the duck. If this happens, the only remedy is to cut away that section of the belt and splice in a new piece, and this must be done as soon as possible. If the decking is not kept clean, a piece of material wedged between an idler pulley and the decking may prevent the idler pulley from revolving and will cause abrasion of the belt.

Skirtboards and chutes must be so designed and supported that under no circumstances will they touch the belt. If the chute places the load on one side of the belt, the belt will tend to run sideways. The same thing happens when the idlers are not lined up true and perfectly square. This necessitates the use of guide idlers, and these will sooner or later wear away the edge of the belt.

Where large pieces of material are handled it is necessary to see that the plunge from the chute to the belt is not too great, as this tends to wear away the rubber cover of the belt.

It is advisable to go over the belt carefully about once a week and examine it for cuts or abrasions in the cover. These should be cleaned out thoroughly, first, with a rubber cement. This protects the canvas body and prolongs the life of the belt, especially where moist material is handled. When the ends of the belt are fastened together it is advisable to use this cement.

In selecting a belt, the size, width and speed of the conveyor should be made proportionate to the size of the material carried, the tonnage handled, and the length and lift of the conveyor. When all these points are not duly considered the belt cannot give full service. It must be realized that large sized material cannot be carried on a narrow belt even if the tonnage is small.

Many concerns have fallen into the bad habit of buying conveyor belts in roll lots, and using the same thickness of belt on conveyors of different lengths. This is a bad practice from an economical standpoint. Short conveyors require less numbers of plies than longer conveyors, width and load being constant. The number of plies should be based on the strain or horsepower pull, of which the length is one of the determining factors. Consequently, to use more plies than needed is a waste of material and money.

Belts should not be run tighter than is necessary to prevent slipping. An overtight belt wears out rapidly. Anything under tension, a piece of twine for example, is cut more easily when tight.

## Traylor Crushing Rolls

Bulletin R-1, of the Traylor Engineering & Manufacturing Co., Allentown, Pa., contains descriptions of several types of crushing rolls and machinery. The design of these are scientifically correct, as well as practically, and especial attention has been paid to provide equal wear on the rolls and crushing surfaces. The methods for securing these results are shown in the bulletin, as well as the various machines with their capacities, etc.

# The Chouteau Avenue Viaduct

## The Open Sections consist of a Reinforced Concrete Slab Floor System Supported by a Series of Concrete Piers. Concrete Delivered from a Central Plant.

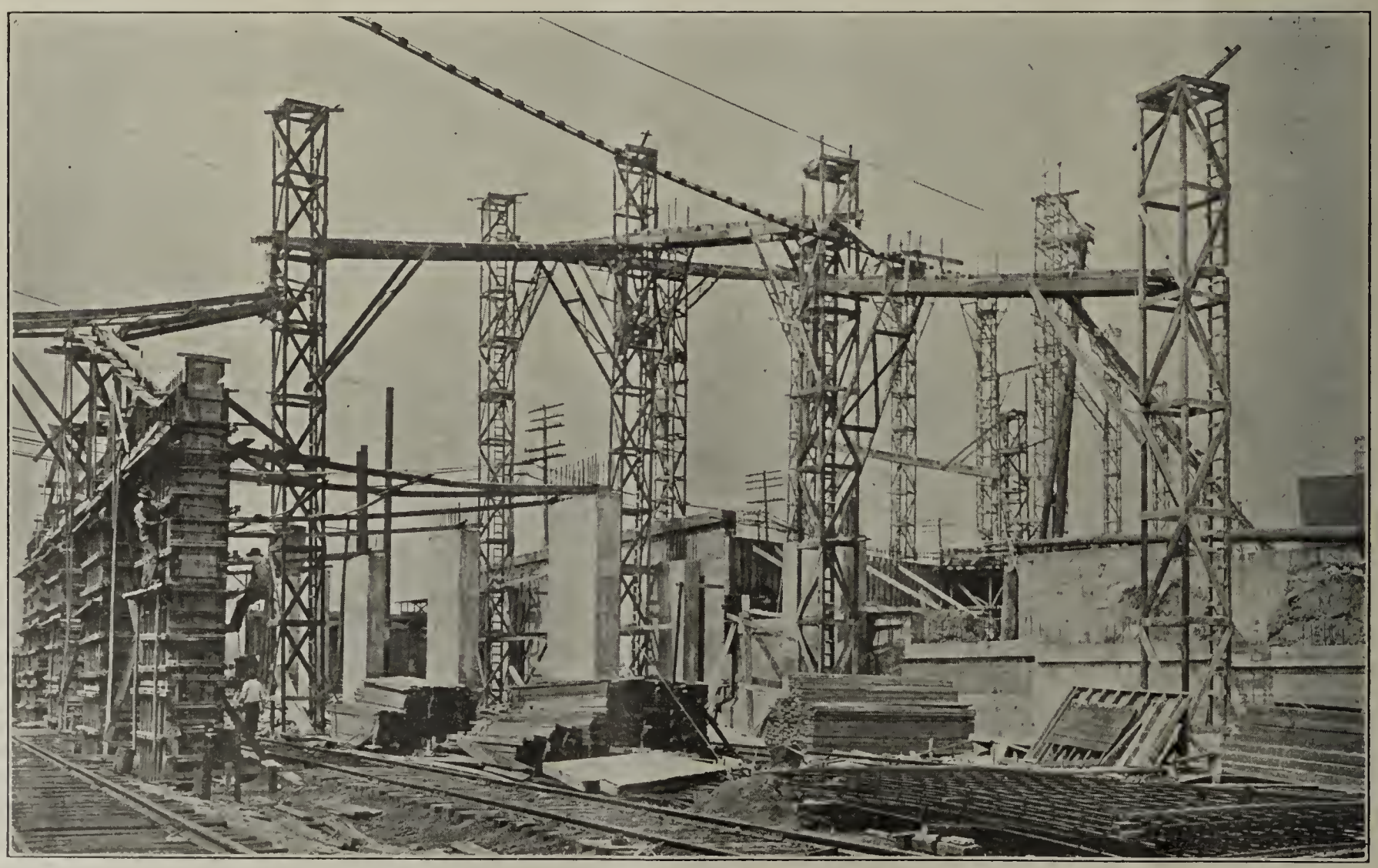
A viaduct was recently completed in St. Louis which exhibits a number of novel and interesting features. This viaduct carries Chouteau avenue over the tracks of the St. Louis & San Francisco and the Missouri Pacific railroads, eliminating a dangerous grade crossing over the latter and replacing a smaller bridge over the former. The construction of the viaduct has permitted the St. Louis & San Francisco railroad to increase its number of tracks from four to eight.

The viaduct extends from a point just east of Vandeventer avenue eastward to the west line of Tiffany street, a total distance of about 1,500 feet, of which about 650 feet is in embankment. The west half has a grade of 3.2 per cent and the east half a grade of 0.9 per cent, which grades give a clearance over the railroad tracks of 22 feet. The viaduct is 80 feet wide, of which 56 feet is roadway containing two street railway tracks, with a 12-foot sidewalk on each side. Near the west end, Pacific avenue intersects Chouteau avenue at right angles and from here a roadway and sidewalk are carried along the south side of the viaduct in each direction, rising on a flat grade that follows practically the surface of the ground, and are connected with the viaduct proper near the east and west ends thereof, as shown in the plan on the next page.

There are two embankments, one the approach at the west end, the other a section about 200 feet long just west of the St. Louis & San Francisco tracks. The open sections consist of a reinforced concrete slab floor system supported by a series of reinforced concrete piers. Each pier consists of a bent of three columns, all the bents being at right angles to the line of the viaduct except those at the railroad tracks, which are placed at a skew, the angle of which is determined by that of the tracks, being 58° 24′ in one case and 61° 50′ in the other. The bents in the normal sections are spaced 27½ ft. center to center, and in the skew sections about 35 ft. The three columns in each pier are spaced 27½ ft. between centers. In all there are 31 piers, or 93 columns, and 4 abutments. An expansion joint is provided at each abutment, and three additional ones were located as shown on the plan.

One side of the embankment section between the two railroad rights-of-way (which was substituted for pier construction because of the elevation of the ground at that point) had been used as an approach to the Independent Packing Plant, which is located just north of the viaduct, and for the accommodation of this plant a traffic subway 22 ft. wide and 12½ ft. high was constructed immediately under the entire north side of the viaduct. The floor of the viaduct at this point forms the roof of the subway, and is supported on the north line by a row of piers 19 to 29 ft. apart, depending upon the location of the entrances to the packing plant. This subway is paved with brick.

The roadway from Pacific avenue westward to join the viaduct connects with this on the approach embankment. That rising eastward connects with the



Building Viaduct Piers at St. Louis & San Francisco R. R. Tracks. At the Left, Completing Forms for a Pier. Wooden Towers Are for Supporting Concrete-Distributing Chutes

viaduct over the tracks, and a side deck is provided here, supported by two additional piers in each of three bents.

The embankments are contained between counterfort retaining walls 2 ft. 3 in. thick and reinforced with ¾-in. round bars laid horizontally. The abutments are similar in construction. Each pier column is 2 ft. thick and 9 ft. measured transversely of the bridge, except at the west skew section, where they are 10 ft., and the east skew section, where they are 9½ ft. Each pier is reinforced with 22 round vertical bars, 1-in. to ⅞-in. thick, depending upon the height of the pier. Where the skew bents and normal bents adjoin, the two come together at one end so as to give the appearance there of one normal pier. The viaduct deck does not rest directly upon the abutments, but upon a set of pier columns which are placed within a minimum of 2 in. from the abutment, the interval serving as an expansion joint. The foundations of the piers extend to bed rock, which is found at depths varying from 8 ft. to 56 ft. At Pacific avenue and around the approach to the subway the piers are protected by traffic guards edged with iron 2½ ft. high and projecting outwardly 14 in. all around.

The deck of the viaduct is of continuous flat slab construction, the slabs being 20 in. thick in the middle of each span and 24 in. over the piers in the normal construction, and 22 in. and 27 in. respectively in the skew construction. That portion over the subway consists of a 10-in. slab supported between reinforced beams 2 ft. wide and 32 in. deep, spaced 10 ft. between centers.

Underneath each sidewalk is left a channel 6 ft. by 8 in. in which to place pipes and wires of the public utilities. Descending from each sidewalk at the Missouri Pacific tracks is a stairway, giving quicker approach to the viaduct from Pacific avenue than by following the inclined roadways. These stairways are of reinforced concrete 5 ft. wide, with 2-in. iron pipe hand-rails, and treads ready cast from designs worked out by a local contractor.

The guards along the outer sides of the viaduct consist of brick walls 12 in. thick, capped with a stone 5 in. thick, the whole being 42 in. high. At intervals, over piers when possible, post effect is given to the wall by slight projections in the brick work 30 in. long. The roadway is paved with wood block.

The viaduct is lighted by 34 lamps supported by posts which also support the trolley wires. These posts are of reinforced concrete 21 ft. high, 12 in. in diameter at the base and 5 in. at the top. They are reinforced with four 1⅛-in. bars around which wire is wrapped. Inside each post are a 2-in. pipe that carries the gas and ½-in. pipe for the pilot. Bronze lighting fixtures are attached near the tops of the posts and the span wires which support the trolley wires are fastened just above these. The posts cost $82 each and the lighting fixtures $180 each. The posts were designed by the city and made by a local contractor, and the bronze brackets were manufactured especially for this purpose.

### Construction Methods

The construction involved about 15,350 cu. yds. of concrete, the principal other items being the wood block pavement of the roadway, which costs $32,466, the lamp posts, brackets, sidewalks, etc. The total of all the contracts was $199,703.

Excavation for the pier foundations was in most places through a mixture of clay, loam and sand, although quicksand was encountered at one place, and here Lackawanna steel sheet piling was used, and a small pump for dewatering the excavation. Excavation down to a depth of 35 ft. was performed by 2 men digging and 2 men removing the dirt by a windlass. Where the depth exceeded 35 ft., a small hoisting engine was employed. Excavations were carried down at an average rate of 5 to 7 ft. a day. The contract price for excavation was 8½ cents a cubic foot.

Three grades of concrete were used in the work, that for the deck being mixed 1:2:4, that for the walls,

**Side View of Viaduct, Showing Construction of Piers**

abutments and piers 1:2½:5, and that for the deep foundations 1:3:6. All the concrete was mixed at a central plant about 200 ft. west of the St. Louis & San Francisco tracks and distributed by the tower and chute method. The concrete plant consisted of two ¾-yd. mixers and its capacity was estimated at 20

**Reinforcement of Floor Slab**
**Concrete-Distributing Chutes Resting on Portable Supports in Background**

cu. yds. an hour, although it frequently ran up to 25 cubic yards. The specifications required that the concrete be mixed for 3 minutes. The materials were brought to the plant in cars. Both mixers discharged the concrete into a single pit at the foot of a main hoisting tower, where it was received in a bucket in which it was carried up the tower and discharged into chutes that led to all parts of the viaduct within a radius of 450 ft. As the western end was more than this distance from the mixing plant, the concrete used near and west of the Missouri Pacific Railway tracks was lifted by a second hoist and discharged into a second set of chutes covering the remaining 500 or

600 ft. All fixed chutes were given a slope of 8½ on 40. They were about 9 in. wide and 9 in. deep and were supported at 40-ft. intervals by towers 4 ft. square, built up of 4 by 4 timbers. The two hoisting towers were 7 ft. square and built up of 4 by 6 timbers. The hoisting equipment at each of the two towers consisted of two electric motors, one a direct current and the other an alternating current. As far as possible, walls and slabs were built in monoliths containing all of the concrete mixed during the 8 to 11 hours of continuous work, or about 200 cubic yards.

Toward the total cost of the viaduct proper, nearly $200,000, the Missouri Pacific Railroad contributed $155,000, the St. Louis & San Francisco $35,000, and the local traction company, $10,000. The work was, however, carried on under the direction of the city. In addition to this, $15,818 was spent in paving a part of Pacific avenue and the 22-ft. roadway connecting it with the viaduct, which sum was prorated between the city and the adjoining property owners. The contractor for the concrete and the guard walls was the F. C. Mueller Co.; for paving the viaduct roadway, the Heman Construction Co.; for the other paving, the Skrainka Construction Co.; for the concrete lamp posts, the Unit Construction Co., and for the walks, J. Herckert.

The work was in charge of L. R. Bowen, chief of the Bridge Division, Department of the President, Board of Public Service of the city of St. Louis. C. W. Martin was in charge of the design, and W. R. Crecilius was in charge of construction.

## Secretary Ideal Engine Company in Regular Army.

Bruce Anderson, secretary of the Ideal Engine Company of Lansing, Michigan, and well known to concrete mixer manufacturers, contractors and builders throughout the country, is a first lieutenant in the regular army and expects to leave soon for France.

Lieut. Anderson, who is a son-in-law of R. E. Olds, millionaire automobile manufacturer of Lansing, was one of the first to offer his services to his country upon declaration of war with Germany. He entered the officers' training school at Fort Sheridan, Ill., and upon being commissioned a first lieutenant was ordered to Fort Sam Houston at San Antonio, Texas.

Lieut. Anderson is an officer in Quartermasters' Machine Repair Shop No. 304, and the character of his work makes valuable the experience he gained during the several years he was an executive of the Ideal Engine Company.

## Concrete Arch Replaces Steel Truss

### Support for Theater Balcony Consists of 104-foot Concrete Arch With Cantilever Trusses

The scarcity of structural shapes, or the difficulty of procuring deliveries on steel, contracted for some time ago, has delayed many a contemplated building. It seems the easier way for a majority of prospective owners to postpone operations, rather than attempt some new feat in construction work to avoid the difficulty. That easy choice of paths to pursue has not been open to the owner, who has already started his construction work, when the tightness of the steel market developed to its acute stage. With him there was already a heavy investment and consequently the motive to seek a substitute was much the stronger.

That was about the situation with regard to the $1,000,000 theater and office building being erected at Third street and Broadway, Los Angeles, Cal., by the Stability Building Company. This building is to consist of two sections, a twelve-story steel frame building on Broadway, to be occupied by the Southern California Edison Company, and back of it, extending along Third street, a large concrete structure, to be used as a motion picture theater. As planned an unusually large steel truss was provided for to support the balcony.

The steel shapes for the Broadway building arrived and with this portion of the construction there was no difficulty but when it came to getting the big truss a snag was struck. It could not be fabricated on the Pacific coast and in the east the mills were so busy that no delivery under eighteen months could be promised. The owner determined that there should be no post nor pillar in the cast interior to sustain the gallery. It was a case of a single span, or no theater.

Architect A. C. Martin sought and found the solution. The Los Angeles Times thus describes the substitute. Mr. Martin found his inspiration in the concrete arches so familiar in bridge construction and straightway adapted it to his purposes. Thus it is that a concrete arch of large proportions, cleverly concealed under its floor, supports the great balcony of the new theater. Never before has such a thing been attempted in a building.

The arch has a span of 104 feet, resting at either end in the solid concrete walls of the building. It is designed to carry a total load of 3,000,000 pounds, including the weight of the thousand persons who can be accommodated with seats in the balcony. The depth of the balcony from the front to the rear is seventy feet. The whole great mass is carried by the one span, one of the remarkable features of the scheme being the system of reinforced concrete cantilever trusses that gives stability to the balcony structure itself and all of which is anchored at one angle or another to the supporting arch. The city building department gasped when the plan was first presented, but, after long study, passed it.

# Reinforced Concrete Bins for Cement Storage

During the early period of development of the Portland cement industry individual mills seldom had a yearly output exceeding a few thousand barrels. Hence, the storage problem was not one of great moment. As a rule, storage bins were simply compartments constructed of lumber, so arranged that aisles were left between bins to facilitate access in packing the product, this usually being done by shoveling the cement from an opening at the bottom of the bin into barrels or bags, which were then weighed on small platform scales.

Following the rapid development of the industry, however, storage and packing methods improved, and reinforced concrete has been extensively adopted for building grain storage bins and elevators and similar structures where permanence and elimination of fire hazard are essential.

Storage bins at all the Universal Portland Cement Company's mills are of concrete construction. Three stock houses at Buffington and two at Pittsburgh are equipped with rectangular bins in which heavy structural steel skeletons take the load. In the stock house at Mill No. 7, recently completed at Duluth, circular storage bins are provided.

In planning the buildings at Duluth, considerable thought was given to the type of construction for the cement stock house, which was to have a capacity of 500,000 barrels. Experience at the Buffington and Pittsburgh plants had shown that a larger number of small bins were desirable. The smaller units, it has been found, also provide greater flexibility in the operation of the packing rooms.

Consideration was given to preliminary plans showing both rectangular and circular bins, but with the introduction of small storage units it was evident that the cost of the rectangular structure per barrel of storage capacity would exceed that of circular bins.

Following a series of experiments conducted on the bins at Mill No. 3 stockhouse, it was concluded that although cement maintains a more or less stable angle of repose, conditions arise to prevent a uniform flowing action while being discharged or drawn from the bottom of the bin, and the cement is likely to remain or hang in a vertical position, or possibly even "undercut." It was further concluded from these experiments that a wall designed to withstand a hydrostatic pressure of 20 pounds per square foot is ample to take care of any likely variations of pressure that will occur in bins of the usual dimensions and, say, of 40,000-barrel capacity. Although these experiments are by no means conclusive, they furnish the only data at present available, so far as we know, upon which to base rational design.

The design of the stockhouse at Mill No. 6, Buffington plant, was based on a hydrostatic pressure of 20 pounds per square foot, and no visible sign of overstraining has developed in this structure during the time it has been in operation. However, with circular bins of less diameter and greater height a design based on a pressure of 25 pounds was deemed advisable, due to the changed conditions.

Plans finally adopted for the stockhouse at Mill No. 7 called for a structure consisting of 27 circular bins, each 33 feet in diameter by 50 feet high, with two packing rooms having car sheds or canopies, a loading platform on each side, a superstructure for the conveying machinery to the bins, and tunnels underneath for conveying the cement from bins to the packing rooms.

Bins are grouped in three rows and are separated into two batteries by one of the packing rooms, one battery of eighteen and one of nine bins. Fourteen interspaces formed by the meeting of outer wall surfaces are also utilized for storage. The twenty-seven circular bins have a capacity of 10,300 barrels each, while the fourteen interspace bins have a capacity of 2,200 barrels each, thus making a total storage capacity slightly in excess of the desired 300,000 barrels.

Bin walls have a uniform thickness of nine inches except where they intersect, at which point they are twelve inches thick. Angles at the intersection are filled in to a distance of five feet on each side at the center line. Horizontal reinforcement consists of ¾-inch rods for the first twenty-five feet from the foundations, ⅝-inch rods for the next ten feet and ½-inch rods for the remaining fifteen feet. Three rods are used to complete the circle, rods being lapped four feet at each splice. All laps are staggered.

Concrete Storage Bins of the Universal Portland Cement Company, Duluth, Minn.

The ¾-inch rods are spaced four inches apart for the first ten feet of the bin walls, five inches apart for the next ten feet and six inches for the next five feet; the ⅝-inch rods are spaced five inches apart for the first five feet and six inches for the next five feet; the ½-inch rods are spaced five inches apart for the first five feet and eight inches for the remaining ten feet. The vertical reinforcement consists of ½-inch rods spaced two feet six inches apart.

The bins rest on foundations of the footing course type, instead of on a continuous slab foundation such as is frequently used in structures of this kind. This resulted in a considerable saving in the amount of concrete required and it was thought that this method of construction would be permissible in this case, as the pressure on the ground was not excessive. The soil beneath the bins, a stiff, clayey formation, has not proved as stable as we had expected it would be, consequently there has been a slight sliding movement of the tunnels. This, while not in any way serious as yet, would not have taken place were these tunnels tied in with the bin foundations by means of a continuous slab foundation. Should an extension to this stockhouse be built, a continuous slab foundation would be advisable.

To further reduce the cost of foundations, form work was built in the shape of a polygon, instead of a circle, thereby permitting the use of short, straight forms requiring minimum skill to make and place. Reinforcing was used only in the upper course of the foundations.

Tunnels, one of which is beneath the center of each row of bins, are built in conjunction with the foundations. They are five feet wide and seven feet high and

contain the screw conveyors which move the cement from the bins to the elevators leading to the packing machine hoppers in the packing rooms. Roofs of the tunnels form a part of the bin floors and have five openings to each bin, through which the cement flows to the screw conveyors. As the tunnel roofs are subjected to the pressure of the overhead cement, they are reinforced with ⅝-inch bars spaced four inches center to center. To resist the upward thrust of the ground, the bottom or floor of the tunnels is also reinforced.

Spaces between the tunnels and bin foundations are filled in with earth on which the bin floors are placed, allowance being made for subsequent settlement from the weight of the cement.

Surmounting the bins is a double-decked, reinforced concrete superstructure which houses the belt conveying apparatus and spouts which distribute the cement to the various bins as it comes from the finishing mill. This design provides a narrow upper deck, or monitor, for the conveyor belt and a broader lower section to give sufficient incline for the spouts to the two outer rows of bins.

To relieve the bin walls of some of the dead load, pilasters were built in conjunction with the walls of the middle row of bins from the foundation to the superstructure.

Over the packing room the superstructure is carried on reinforced concrete girders spanning 48 feet from center to center.

As the length of the structure is 388 feet and the extremes in temperature are considerable, provision for expansion was made at the central packing room by providing sliding joints where the girders rest on the supporting columns.

The roof of this building consists of reinforced concrete slabs, cast in place.

The packing rooms, which house the packing equipment, consisting of automatic packing machines and hoppers, are of the same general layout except that the one between the bins may receive cement from either side and has two elevators, while the end packing room receives from one side only. Beneath each is a basement containing the driving machinery for the screw conveyors in the tunnels and the cross screw conveyors which convey the cement from any of the tunnel screw conveyors to a bucket elevator by which it is delivered to the second floor of the packing room.

All conveying machinery in the tunnels, basements and packing rooms is driven by electric motors direct connected to speed reducers which drive the conveyors at the proper speed. By this method the driving mechanism is simplified and the number of moving parts greatly reduced, thereby reducing the hazard of injury to the operators.

The end packing room has a slanting roof of structural steel covered with cement tile. Should the storage capacity of the plant be increased at a future date, the extension will be built from this packing room and this type of roof admits of easy alteration when the extension takes place.

Reinforced concrete car sheds, or canopies, at each side of the packing rooms, extend over two loading tracks, providing shelter for four cars at each packing room.

Mill No. 7 stockhouse was designed by the company's own engineering department, which also furnished the specifications and all detail drawings for its erection.

While examples of circular reinforced concrete storage bins for cement are not numerous in this country, we find two or three instances where they have been erected for fairly large stockhouses. One of which detailed information has been given is the one designed and erected by the Macdonald Engineering Company, of Chicago, for the Dewey Portland Cement Company, Dewey, Oklahoma. A description of this structure may be found in Cement Record, Volume 4, 1910. This is a four-bin structure in which the bins are 32 feet in diameter by 80 feet high, with interspace and two side spaces also used for storage, giving a total capacity of 60,000 barrels.

## Insuring Maximum Strength of Concrete Pavements

It is poor business to build with concrete and not take the necessary precautions to insure maximum strength. Good concrete can be made without difficulty if a few simple rules are followed.

Good aggregates, water not to excess, and proper mixing, are necessary. In addition, particularly in concrete road work, careful attention should be given to curing; that is, that the concrete shall not be permitted to dry out too fast and not be put into use before it has gained sufficient strength to carry its loads safely.

It is especially important during hot, dry periods that newly laid concrete shall not remain exposed to sun and wind. When it has hardened sufficiently, it should be covered with a canvas and kept wet. As soon as sufficient hardness has been attained by the concrete, the canvas should be removed and the pavement covered for two or three inches in depth with sand or earth and kept moist for seven to ten days, after which it should be allowed to dry out for a period not less than ten days before traffic is permitted to go upon it.

Most cities have ordinances providing penalty for using a street that is under construction before it is thrown open to traffic. All cities should enforce these ordinances as is done in New Castle, Pa., where a driver was arrested recently for driving upon a concrete pavement before the specified time had elapsed for opening it to traffic.

The injury that may be done by a heavy load to newly laid concrete is not always immediately apparent, and, in fact, there is often no surface indication at first to show that any harm has resulted. But after the pavement has been in use for a few months and repeated heavy loads have gone over it, the weakened condition of the concrete is disclosed and makes expensive repairs necessary.

Engineers should insist upon good aggregate, water not to excess, proper mixing and careful curing.

## Fifty-Seven-Foot Concrete Pavement Finished with Long Belt

Concrete pavements 57 ft. wide were floated with a belt successfully in Ogden, Utah, early this season. The belt was 59 ft. long and handled easily by two men, who went over the road at least twice after the surface was struck off.

In striking off the pavement a row of stakes, 10 ft. apart, was driven down the center line to finished grade, and on these a channel iron was placed to support one end of a strike board templet for one-half the street. The center end was operated from a bridge which was mounted on wheels and easily pushed along.

Reinforcing of triangle mesh was placed 2 in. below the surface, and ¼-in. felt expansion joints were inserted every 60 ft. Although there is as yet no pushing, the city engineer is of the opinion these should be at least ½-in. thick. No cracks had appeared in these large slabs in the two blocks laid last fall or three blocks laid this spring.

# Concrete Sewage Disposal Plant

To any one attracted by good concrete, and especially as used for sewage disposal plant construction, an inspection of the new plant at Columbus, Ohio, will prove highly interesting. The old sewage treatment works adjacent to the Scioto river near Columbus have been remodeled and the old system replaced by twenty-two Imhoff tanks of reinforced concrete.

A glance at the accompanying photographs will convey an idea of the general arrangement of the tanks. The sewage is first carried into these tanks. The solids are automatically separated from the liquids and fall into the lower chambers. From these chambers the gases that form are carried off through the vent pipes. By means of pumps the sediment or sludge is later pumped out and allowed to flow out on the drying beds, whence it is afterwards hauled away and dumped on the city farm. The liquid portion is carried off through the channels and sprayed over crushed stone beds. This method of treatment results in the liquid portion being rendered almost free from contamination so that it can be discharged into the river with little, if any, danger of pollution. The plant has a capacity of thirty-five million gallons per twenty-four hour day, which is almost double the old plant. This is normal capacity, but might be increased to fifty million gallons.

The contract for this work involved removing 950 cubic yards of old concrete, and the contractor was required to so prosecute this work as not to interfere with the continuous treatment of sewage. Channel drills were employed and care exercised so that no cracks would appear in the concrete beyond the section to be removed. Dynamite was rammed into the holes and large chunks of concrete blasted off at a time. In joining new concrete to sections of the old left in place, recesses were made or grooves cut so as to obtain a strong bond.

The new concrete exceeds 9,000 cubic yards. Atlas Portland cement was used exclusively to the extent of about 25,000 barrels. There was one central mixing plant were a ¾-cubic yard mixer was stationed. It was so placed that materials for the concrete were transferred to it by gravity. The concrete was then hoisted in a large bucket and swung by means of derricks to a distributing car. This car, running on small tracks, was shoved where desired and concrete spouted from it into place. This plan was found to work better than a tower with long spouting arrangement. The concrete consisted mostly of a 1:2:4 mixture. A part of it, especially the floors of the settling tanks, was of a 1:2½:5 concrete; washed sand and gravel were secured from the Scioto river, one inch gravel being used.

When Columbus, Ohio, Decided to Rebuild Its Sewage Disposal Plant with Modern Imhoff Tanks, the Question of Reconstruction Was Investigated Thoroughly. Instead of Abandoning the Old Plant it Was Finally Decided to Rebuild it, Utilizing the Old Construction As Far As Possible
The Old Concrete Was Repaired by Cement-Gun. The Extensive System of 2-inch Partitions Forming the Gas-vent Wells, Were Constructed by Cement-Gun, Using Expanded Metal, with Rib Stiffners, As Shown in the Illustration
This Is Said to be the Largest Job if Its Kind on Record, Where Single Story Septic Tanks Were Converted into the Imhoff Type

The twenty-two Imhoff tanks embrace 140 sections with hopper bottoms approximating in size 19 feet 6 inches by 14 feet 8 inches by 27 feet 6 inches deep. The walls are heavily reinforced, requiring particular care in puddling of the concrete. The walls of the tanks were figured for all conditions of loading; earth pressure with tanks empty; tanks full with earth pressure removed, full tanks with empty adjacent tanks. The walls thus needed to be strongly reinforced to take care of the pressure which might exist under maximum loading. A 12-inch thickness was used for the lower part of the side walls, 10 inches for the balance of the side walls, cross walls and floors of settling tanks, and 8-inch walls to form channels between tanks.

The building of the two-inch partitions was accomplished by use of the cement gun, which has advantages over ordinary plastering in the way of speed and also density of the mortar. Metal lath was securely fastened in place and the scratch coat first applied to the rib side which forms the interior surface of the wall. This mortar consisted of one part cement and three parts sand and one-tenth part lime by volume with some hair added. This coat was roughened and allowed to harden and then the balance of the mortar applied with cement gun on both surfaces. The interior was floated and troweled to a smooth finish. Thickness of partitions is two inches.

Concrete posts and slab walls two inches thick were used for dividing and bounding the sludge drying beds. The posts are cast with grooves to admit the slab. The slabs are cast in molds and reinforced with rods.

Due to the true alignment necessary for the tanks, particular care was required to have the forms properly and exactly placed; in fact, constant care has been exercised throughout the job thus far as the intricate construction work demanded. Attention was especially paid to the matter of the reinforcement and to the character of the concrete. This modern sewage disposal plant was designed by J. J. Morgan, consulting engineer, in conjunction with C. B. Hoover, chemist; C. B. Cornell is resident engineer on the job, assisted by J. M. Heffelfinger; D. W. McGrath & Sons are the contractors, all of Columbus. The contract price was $200,000.

Concrete Sewage Disposal Plant

## Machine House Doubling Capacity

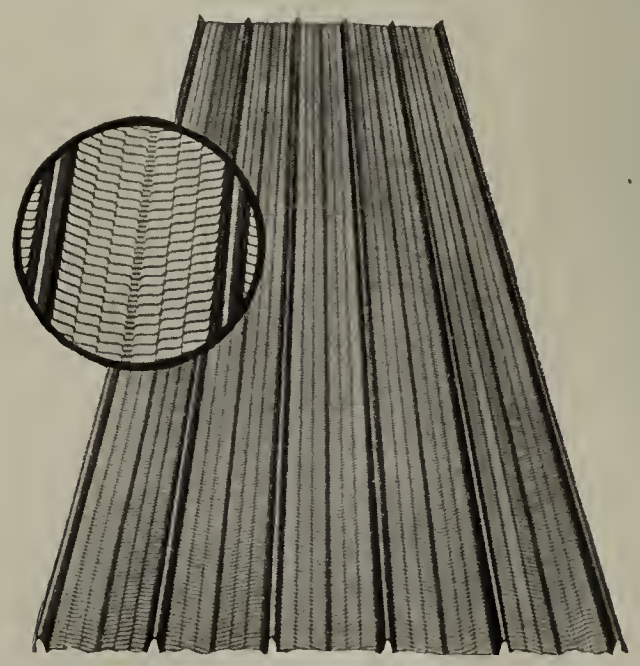
Clapp, Norstrom & Riley, 12 S. Canal street, Chicago, have just closed a very successful year, during which time they have constructed new shops, thereby more than doubling their previous capacity. At one time in the last few months there were from eight to ten second-hand locomotives being rebuilt in their shops, and their facilities for turning out used equipment in A No. 1 condition, absolutely guaranteed same as new, is undoubtedly the best in the country. Many large industrial concerns are now acquainted with the excellent service being rendered by this progressive firm, and the year 1918 begins with a bright outlook for continued good business.

## Chain Drive for Cement Mills

The Link-Belt Company, Chicago, has recently issued several very interesting publications, one of which is Booklet No. 253, called "The Ideal Drive for Cement Mills," that describes and amply illustrates the large Link-Belt Silent Chain Drive installation at the Nazareth Cement Co.'s plant, Nazareth, Pa. Concerning that it is stated that after 10 months' service, 24 hours per day, a careful examination of these silent chain drives showed that they were practically as good as when installed; there was no evidence of undue wear on the chains or on the wheels. Another great advantage of this installation is its compactness. These drives have now been in operation, it is further stated, without any replacement for more than two years. They are dust-proof. Among other issues are Link-Belt Silent Chain data book No. 125, for 1917, very valuable for its complete information required when installations are to be made. Another is Link-Belt and Sprocket Wheels for Sawmills. Still another is catalogue No. 270, illustrating and describing the popular Link-Belt wagon and truck loaders. Lastly, there is a hanger printed in the national colors and bearing part of President Wilson's proclamation of April 15, addressed to railroad men, shipbuilders, farmers, miners, industrial workers, manufacturers, merchants and, in fact, the whole people, concerning the supreme need for their energy and co-operation in the world crisis of war. Copies will be sent on request.

## Combined Centering and Reinforcing Plate for Fireproof Construction

An expanded metal combined centering and reinforcing plate for light weight fireproof construction is illustrated below. The design is a network of strands forming meshes between V-shaped stiffening or supporting ribs. These ribs have an inverted arch-shaped formation at their base, from which the turned-on-edge mesh strands start. This patented curve flange which connects with the expanded metal, increases the rigidity of the ribs and provides additional strength. The ribs are cold formed, thereby increasing the elastic limit of the metal. They act as beams in supporting the wet concrete or plaster, thus eliminating form work on short spans in floor or roof construction; also studs and furring in plastering work. The turned-on-edge mesh stiffens the expanded metal between the ribs and develops the full tensile strength of the metal. It also prevents the plates from becoming twisted or distorted



Ribplex—An Expanded Metal with Rib

in shipping or erecting. The plate is 24 in. wide; stock lengths 4, 5, 6, 7, 8, 9, 10, 11 and 12 ft. Gauges 24, 26 and 28. Ribs ¾ in. deep, spaced 4.8 in., center to center. This plate is being put out under the trade name of Ribplex. CEMENT & ENGINEERING NEWS, 672 Transportation Bldg., Chicago, will gladly send any of its readers a catalog giving prices, information, etc., concerning this product.

## Develop Local Sand and Gravel Deposits

Demands of the government covering the use of every available freight car for the transportation of war supplies creates a new problem for many concrete block and tile manufacturers; that is, the securing of an adequate and permanent supply of sand and gravel. Of course, carloads can be shipped now and then from the usual source of your supply, but owing to car shortage and rail congestion this supply may not be depended upon.

The natural solution to the problem, therefore, is to develop some local deposits of sand and gravel, the degree of development depending entirely upon your needs. Special machinery and equipment for digging, washing and grading will be necessary, if you are to do this yourself. On the other hand, very satisfactory arrangements may be made with some local dealer and clean, properly graded materials and prompt delivery thus assured.

The anticipated shortage of these necessary supplies will suggest the necessity of immediate arrangements for supplying your needs for the coming year.

## Land Cement Contract

Bids were opened recently for furnishing of the cement for the part of the Grant highway Winnebago County is to build with its $145,000 bond issue, and the contract for the 20,000 barrels of cement was awarded to the Skandia Coal & Lumber Company, Rockford, Ill., on its bid of $2.20 per barrel. There were seven other bidders, their figures ranging from $2.29 to $2.21 per barrel.

## Concrete Trimmings for Brick Buildings

The Trusswall Manufacturing Co., Kansas City, Mo., has developed a very satisfactory business in the line of concrete copings and trimmings for brick buildings. The firm manufactures a very carefully mixed and graded concrete which is given a surface treatment to make it resemble cut stone. The forms are made so that the molded pieces form the proper relief line to decorate brick work. Window caps and window sills are included in this trimming material and every projection is provided with a suitable grip. This artificial stone is manufactured at the factory of the Trusswall company and fully cured and seasoned before it is delivered to the job. Large quantities of the material have been used in Kansas City and the immediate vicinity and the product is very effectively standardized. The accompanying illustration was made from a photograph of a new department house which is now about completed, all the trim of which is made of the material mentioned above.

Dredging Plant of the McLain Sands Co., Point Marion, Pa., Equipped with Elevator Dredge, Austin-Western Crusher, Ruddock Clam Shell Buckets, Screens, Etc.

## Rock Crushing Equipment

The Allis-Chalmers Manufacturing Company of Milwaukee, manufacturing as it does such an extensive line of machinery and equipment, has its catalogues divided up into a number of sections, so that only such sections as may interest an inquirer need be sent out. The various sections are assembled in a heavy cover.

Some of these sections are of special importance and interest to readers of CEMENT AND ENGINEERING NEWS, notably Bulletin No. 1411 on Rock Crushing Plants, and Bulletin No. 1415 on the Gates Rock and Ore Breaker.

This latter is devoted entirely to illustrating and describing the various parts of the Gates breaker. The other bulletin is of especial interest because of the fact that it includes a large number of sectional views of crushing plants. These views are made from actual plants which this company has designed for various parts of the country, and cover a wide range, from a small plant, designed for a small Wisconsin town, up to plants of large capacity for producing railroad ballast, or crushing stone for the general contracting field.

# Concrete Rapidly Taking Lead in Paving

Concrete is rapidly increasing its lead as a road-building material, is shown in a review of the progress made by the State of Washington in highway construction during the year just now drawing to a close, says the Seattle Times.

Approximately twice as many miles of county roads have been surfaced with concrete as have been surfaced with all other types combined. Figures compiled by highway engineers show 410.76 miles of hard surfaced roads in place or under contract in Washington. Of this 273.35 miles are of concrete, while all other types combined form 137 miles.

Virtually all the hard surfaced roads laid outside the main cities of the state have been of concrete, which has gained the name of the universal pavement, because more concrete roads have been laid in the United States than of all other kinds of paved road combined.

### Stretch of 121 Miles

With the completion of the Duwamish-Renton Junction section there will be a paved stretch of 121 miles on the Pacific Highway extending from a considerable distance north of Everett to far south of Tacoma. Of this paved stretch the greater part is of concrete.

This year just closing has seen more than 1,000,000 square yards of concrete highways laid or awarded to contractors in Washington.

Permanent road construction in the state outside of the cities began about eight years ago. Lewis was the first county in Washington to use concrete as a surfacing material, and so successful was this method of construction that now concrete overshadows all other types of paving. The great bulk of this modern construction has been in Western Washington.

### Uncle Sam Uses Concrete

The nation is laying concrete in the same proportion, concrete mileage exceeding that of all other forms combined. There are now almost 100,000,000 square yards of concrete paving in the country, virtually all laid since 1908. In the first six months of this year the State of Washington laid more concrete than any other state in the Union, with one exception.

New concrete roads are constantly being opened to general traffic in this state, making Washington a veritable paradise for the motorist. Touring possibilities at all seasons of the year are being realized. The safety features of the concrete road, the fact that it prevents skidding and that pleasure riding is available every day in the year are bringing new converts to concrete highway construction.

Every concrete road through the open country is a veritable boulevard, making riding a pleasure by doing away with dust in dry weather and mud in wet weather and all sorts of jar and discomforts. The smooth surface makes motoring easy, reduces the tire upkeep cost and saves gasoline.

Concrete roads are helping the nation win the world war by increasing the efficiency of every form of road locomotion. Motor trucks and horses can go faster, farther and with less effort over concrete than any other kind of road. Concrete is helping the farmer by assisting him to haul two loads at one trip instead of one load at two trips. It either doubles the size of the load or cuts in two the tractive power necessary to transport farm produce. With less capital tied up in horses there is more cash to put into other equipment to increase the revenue.

The concrete road reduces the strain on horses and lengthens their lives. It reduces wear on wagons and harness. Where motor trucks are used it lessens tire and gasoline expense. It puts the farmer into a state of preparedness to reach markets quickly when prices are best, so that he can take his profits quickly and get home with more cash than he could by slow hauling on a bad road. It adds to the acreage value of his farm because it increases its earning possibilities. A concrete road makes all these advantages permanent, bringing profit to the farmer daily in the form of time, effort and equipment saved.

In order that the concrete that goes into the roads of the state is properly laid, the five cement companies in Washington—the Superior, Washington, Olympic, International and Lehigh Portland Cement companies—formed the Northwestern branch of the National Portland Cement Association, maintaining for all in this territory an inspection service that is an absolute guarantee to county and state authorities and to taxpayers generally that the cement roads are faultlessly constructed. This inspection service is under the direction of Chester N. Reitze as district engineer.

### Finest Roads in Land

Such thoroughness as this, road engineers point out, is giving to Washington the finest concrete highways in the land—roads that will stand up under the heaviest traffic and wear for years and years. Experience demonstrates in the various counties that a concrete road laid under such inspection conditions requires practically no maintenance cost—repair expense. The actual figures in several counties show expense of only $5 and $10 a mile a year.

Cities and towns throughout the state are finding they must hurry to keep up with the good roads movement in the surrounding country, the criticism often being heard that the best roads are in the rural districts.

# Giant Portland Cement Shows Decrease in Net Profit

The Giant Portland Cement Company's (Philadelphia) annual report for the fiscal year, shows net profit of $27,291, against $63,531 in the preceding months.

President Charles F. Conn in his remarks to stockholders says:

"Additions and betterments amounting to $134,914.86, charged to plant account, have been made to increase manufacturing facilities.

"Shortage of labor, repair materials and coal caused a decrease of production and an increase of manufacturing costs. At the Norfolk plant 150,000 barrels of cement were manufactured and sold, but a considerable financial loss resulted due to unusual operating difficulties. Many of the mechanical and chemical problems have been eliminated and better results should be obtained during the coming year. The expressed desire of the Government that industries directly contributing to the prosecution of the war shall be given priority in the use of labor and materials, indicates a curtailment of general building activity and a decrease in the amount of cement which will be used in 1918."

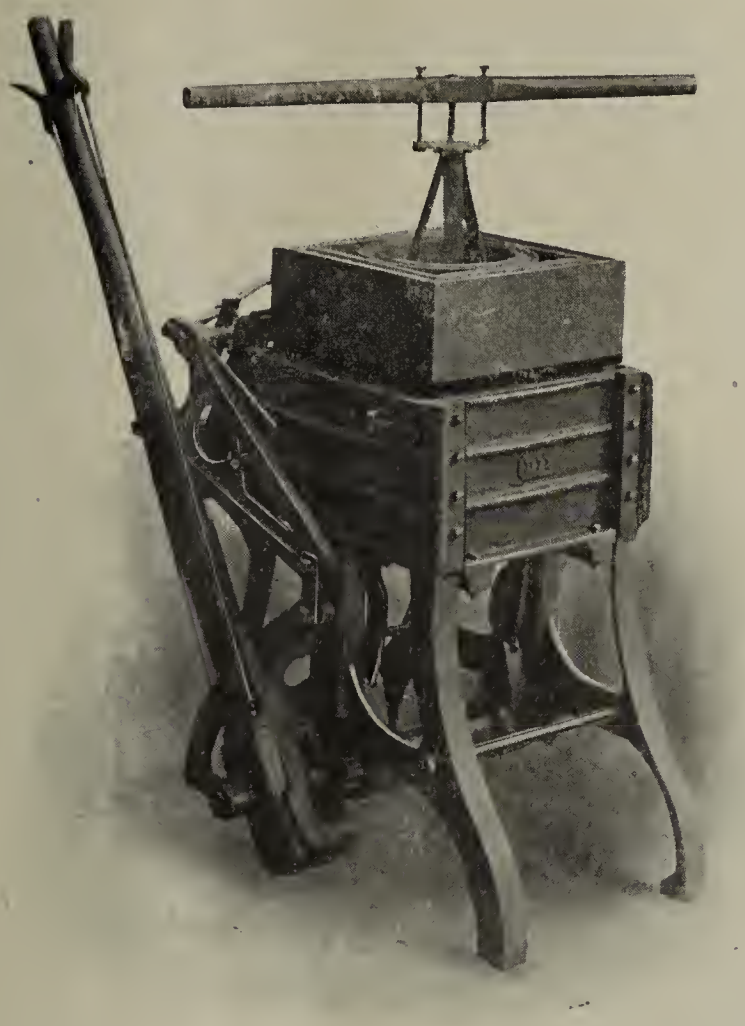
The income account for 1917 compares as follows:

| | 1917. | 1916. | 1916. |
|---|---|---|---|
| Gross receipts ..... | $1,833,757 | $1,388,677 | $1,046,951 |
| Mfg. & op. exp..... | 1,643,972 | 1,149,663 | 878,436 |
| Taxes, less chg. res.. | 11,081 | 11,861 | 13,039 |
| Net op. earn..... | 178,703 | 227,153 | 155,473 |
| Bond interest ..... | 39,750 | 42,750 | 45,000 |
| Balance ..... | 138,953 | 184,403 | 110,475 |
| Res. for dep. txs..... | 111,662 | 123,872 | 140,078 |
| Net profit ..... | 27,291 | 63,531 | 6,397 |

## The Multiplex Press

Speed, simplicity, durability and versatility are some of the virtues claimed for the Multiplex concrete block machines by their makers, the Multiplex Concrete Machinery Co. These machines have been improved and the 1918 models contain many little points of advantage not embodied in those of earlier design.

The company asserts that when a man buys a Multiplex machine he has gone a long way toward equipping a complete concrete products plant, for the reason that one machine, with its various attachments, can be made to produce hollow block, veneer block, block for a two-piece wall system and a special type of block used in building chimney flues. This question of concrete block chimneys is one that is of general interest to owners of concrete plants, as the chimneys are gaining popularity among builders and have much to recommend them, in preference to chimneys of other materials. The Multiplex catalog contains much of interest to all concrete block manufacturers on special types of block made on standard types of machines. Cement & Engineering News, Transportation Bldg., Chicago, will gladly send interested parties a copy of the Multiplex catalog.



The Multiplex Press

## Association of Northeastern Michigan Gravel Producers

John S. Porter of Saginaw, Mich., was elected treasurer of the sand and gravel producers of northeastern Michigan at a meeting recently held, representatives from a number of the principal sand and gravel concerns being present. William Reardon of Midland was elected president; O. W. Smith, Oxford, vice-president; and S. A. Glaram, Evart, secretary pro tem. The companies all declared their intention of increasing the production of gravel to the extent necessary to meet the needs of their respective territories.

## Concrete Lumber for Railroad Snowsheds

"Concrete lumber" is the material being used by the Union Pacific railroad in the construction of snow sheds at Rock River and other points in Wyoming.

It is really not a stretch of imagination to call this material "concrete lumber" for the reason that the concrete is being prepared in slabs, some of them 3 by 6 feet and others 3 by 15 feet in size. But with the exception of a reinforced rim around the edge, these slabs are only 2 or 2½ inches thick. The slabs will be fastened to the frame work in much the same way that lumber is attached to studding.

This is the first time in the history of American railroading that material of this character has been used for snow sheds and it is being watched with much interest. The material is known as "Unit Bilt" construction, and the structures are being erected by the Houghton Construction Company of San Francisco, under the direction of W. R. Armstrong, engineer maintenance of way of the Union Pacific Railroad Company, at a total cost of approximately $1,000,000. At Rock River the snow sheds are to cover three tracks.

Snow is not heavy in Wyoming, but last winter a strong wind which centered around Elk mountain carried this snow a distance of 20 miles across the table land, mixing it almost half and half with sand, and deposited it in the cuts along the Union Pacific.

While it is probable that the Union Pacific will never experience a winter as severe as last winter, these snow sheds are being built as insurance against such a possibility.

## New Austin-Western Catalog

"The first piece of improved road machinery ever made," states the Austin-Western Road Machinery Company, of Chicago, "was manufactured by this company over 40 years ago; before that there was nothing better than a crude drag." What has since been achieved by this well-known concern is common history in the road field of this country and abroad.

General Catalog No. 18 has just come off the press. It is of convenient size, attractively gotten up, and has the big advantage of presenting the various types of road-building machinery in brief but easily understood language.

In its 52 pages are described and illustrated bins, dump cars, carts, jaw and gyratory crushers, road drags, elevating and blade graders, grader-scarifiers, road oilers, planers, plows, rollers, scarifiers, drag and wheel scrapers, street sprinklers and sweepers, and dump and spreader wagons.

The company also furnishes special catalogs on any of the aforementioned machines and will cheerfully give full information on any of its products to all who are interested.

For direct and quick service, the Austin-Western Company has branch offices in New York City, Columbus, St. Paul, Portland, Ore., San Francisco, Los Angeles, Dallas, Atlanta, Jackson, Miss., Memphis, Richmond Va., Oklahoma City and Boston.

## City to Let Big Cement Contract

The Oregon Portland Cement Company is to receive the city of Portland, Oregon, contract for furnishing 5,000 barrels of cement during this year. Recommendation to that effect has been made by City Commissioner Kellaher. The company bid $2.05 a barrel for the cement on the dock. The other bidders each asked $2.10 a barrel.

## The Crushed Stone Industry

Few people realize the extent of the crushed stone industry in the United States. Even when it is known that the output of United States quarries during 1916, according to the only complete statistics available, amounted to more than 48,000,000 tons, it is difficult to visualize this great industry which has grown to its present proportions within a comparatively few years.

The three great uses for crushed stone are for road metal, railroad ballast and concrete. During 1916, 19,824,762 tons of crushed stone went into the construction of roads; railroads took 10,655,015 tons, while 17,595,804 tons were used in the manufacture of concrete. Of these 48,075,581 tons, 32,184,036 tons were limestone.

Ohio headed the list of producing states with an output of 6,361,570 tons of crushed stone. Illinois was second, with 5,508,854 tons; New York, third, with 5,127,483 tons. Pennsylvania produced 3,491,789 tons and California, 3,220,964 tons. Indiana, Kentucky, Virginia, New Jersey, Wisconsin, Michigan, Connecticut, Tennessee, Massachusetts and Missouri came next in the order named, each producing more than 1,000,000 and less than 2,000,000 tons. Forty-six states and territories reported crushed stone production during 1916.

The certain enormous future for concrete and the extensive road building program to which this country seems pledged are sufficient to give permanency to this form of industry, even without the demands of railroads.

## Pulverized Limestone for Agricultural Use

Pulverized limestone continues to be in favor as a soil sweetener or fertilizer, according to reports from producers to G. F. Loughlin, of the United States Geological Survey, Department of the Interior. Since the figures of production were first compiled in 1911 the industry has steadily increased, and the output for 1916 of 1,066,376 short tons, valued at $1,146,582, represents a gain of 512 per cent in quantity and 460 per cent in value for the six years. The increase for 1916 compared with 1915 was about 32 per cent in quantity and 28 per cent in value.

The states contributing 73 per cent of the quantity and 75 per cent of the value of pulverized stone to the trade in 1916 were as follows:

| | Quantity (short tons). | Value. |
|---|---|---|
| New York | 102,608 | $164,237 |
| Illinois | 203,829 | 135,908 |
| Pennsylvania | 73,301 | 129,574 |
| Virginia | 146,703 | 106,166 |
| North Carolina | 53,532 | 77,101 |
| West Virginia | 47,709 | 74,865 |
| Tennessee | 66,854 | 64,910 |
| Ohio | 55,236 | 54,591 |
| Vermont | 27,489 | 54,535 |

Twenty-three other states contributed to the total. The average price per ton was $1.08 in 1916, 2 cents less than in 1915.

In some localities the pulverized material is a by-product of the crushed-stone and building-stone industries; in others the limestone is ground for this purpose entirely.

Loading Dump Cars in the Quarry of the Tomkins Cove Stone Company

## More Profit for the Quarry

Owners of limestone quarries should remember that ground limestone and lime are valuable soil amendments, and that their use on many farms has brought about a great increase in the crops. In the profitable "intensive" farming carried on by all up-to-date agriculturists every square yard of ground is made to produce the largest possible quantity of grain, fruits or vegetables. This requires constant attention to soil treatment and cultivation, and increases the demand for ground limestone, or quicklime, for soil improvements.

A number of quarrymen have entered this field and they are finding it one which can be further developed at a profit to themselves, as well as to greatly improve the fertility of soil in their community.

## Texaco Cetus Oil

The writer called at a Portland Cement plant today, and upon going to the power house received the following report on our Texaco Cetus Oil which they are using in their turbines. This is certainly a record for turbine oil, writes B. C. Phillipps, in "Lubrication," published monthly by The Texas Co., New York, N. Y.

**Turbine and Generator**

| | |
|---|---|
| Make | Allis-Chalmers |
| Size | 1500 kw. |
| Speed | 1500 r. p. m. |
| Governor spindle | 498 r. p. m. |
| Oil pump | 498 r. p. m. |
| Cross shaft | 310 r. p. m. |
| Bearing pressure | 3.5 lbs. |
| Relay oil pressure | 25 lbs. |
| Boiler pressure | 140 lbs. |
| Steam inlet | 100 lbs. |
| Vacuum | 27.5 lbs. |

This machine was installed in January, 1914. The oil reservoir, which is a storage reservoir and not a filter, has a capacity of 100 gallons. Texaco Cetus Oil was placed in the oiling system at the time of installation, since when the turbine has been in operation continuously, except Sundays and twenty-one days that it was shut down for general overhauling. This makes a total of 1,230 days or 29,540 hours of operation. Four times since the turbine was started, that is once each year, the oil has been taken out of the reservoir and poured through a cheese-cloth into a barrel, and replaced in the turbine oil reservoir. This is all the filtering that it has received. Once each month 7.5 gallons of Cetus Oil are added to the reservoir to make up the loss from leakage and evaporation. At no time has there been a dollar spent on this turbine for repairs. The last time it was shut down for general inspection a micrometer was used to measure the bearings, the shafting of the turbine, and the generator, and it was found that it did not show any wear.

In this plant they have two Westinghouse turbine generators of 1000 kw. each. These units receive the same treatment as the one mentioned above, and while they have not been in operation as long, there has never been any trouble due to lubrication. On their dry vacuum pumps the valves are lubricated with Texaco Ursa Oil, and they have never been heard to groan nor have they been found covered with carbon. Texaco lubricants are used throughout this plant.

The engineer of this plant stated that anyone who was having trouble which could be laid to lubrication was at liberty to write to him and he would endeavor to explain the Texaco way to overcome it. As this gentleman has been erecting engineer for three of the largest turbine manufactories in the United States, as well as having worked in their shops, he has been through the operating game from A to Z with all kinds of turbines and engines, and is therefore in a position to speak authoritatively on the subject.

(Signed) B. C. PHILLIPPO.

## Cement Drain Tile in Demand

An increase in land drainage projects in Lane County, Oregon, is shown by the demand for cement tile, reports George Hall, manager of the Eugene Concrete Works, Eugene, Oregon. The volume of business at the Eugene plant is unprecedented and work was carried on as usual throughout the cold weather. The Eugene factory has a daily capacity of 1,800 feet of four-inch tile, the size used most extensively in draining land. This plant is equipped with a Dunn tile machine.

## Portable Electric Driven Tool for Surfacing Concrete Work

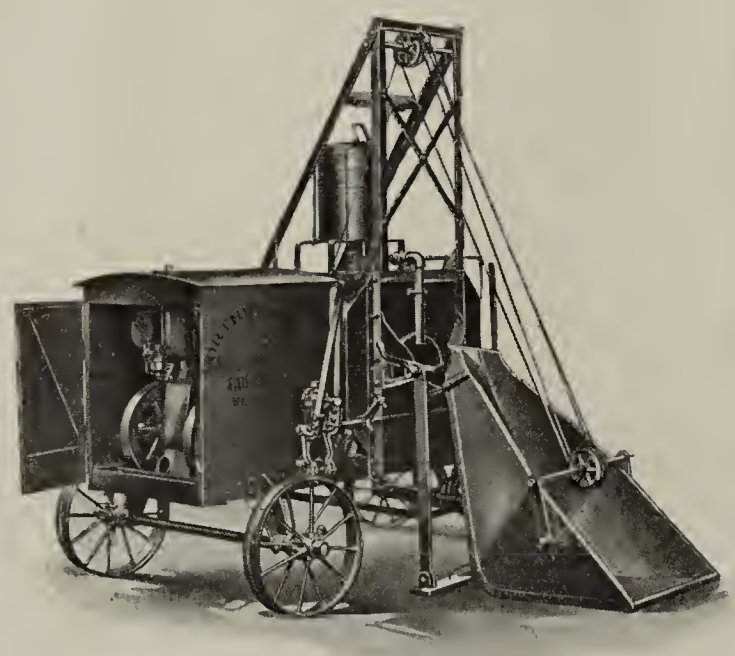
The removal of board marks, fins and irregularities from a concrete surface, as well as its preparation for a painted or float finish, by hand rubbing is an expensive process. A portable electric driven tool that does this work at a low cost has been placed on the market. On account of its peculiar cutting action the machine also produces a perfect bond for float or other finish. It also is adapted to the production of special finishes on synthetic and imitation stone. The machine comprises a cutting tool driven through a flexible shaft by an electric motor carried by the operator as shown in the illustration. The tool itself weighs but 9 lb., while the complete outfit including the motor weighs only 30 lb. The cutting tool consists essentially of a disc in which are mounted 16 hardened steel cutting wheels. These cutter wheels roll on the surface to be dressed and are so designed that their teeth remove the material by a chipping action. A special stone and grinding attachment is interchangeable with the cutting tool and is used for grinding in a mixture of cement and sand which is swabbed on the surface after the board marks and projections have been removed by the cutting tool. It is stated that in removing projections and fins only in preparation for a float or rubbed finish the machine will prepare 100 sq. ft. per hour; cutting down the surface to one color, leaving a perfectly flat wall, can be done at the rate of 70 sq. ft. per hour; the aggregate may be exposed similar to a bush hammer finish, at a rate of 60 sq. ft. per hour; the stone grinding attachment will produce from 35 to 50 sq. ft. of surface per hour. The operating expense, exclusive of wage of operator, but including depreciation and interest, current, lubrication and renewal of cutters, is stated to be less than $1.65 per day. The machine is known as the Berg Rotary Concrete Surfacer. Cement & Engineering News, 672 Transportation Bldg., Chicago, will gladly send any of its readers a catalog illustrating and describing this tool.

Berg Machine Arranged for Ceiling Work

## A Money-Saving Device

Contractors who have been paying high prices for gasoline for engines on equipment will welcome a reliable carburetor which will cut the cost of fuel from 24c to 8c per gallon.

This can be accomplished with the NORTHWESTERN Twin Service Carburetor. It is guaranteed by the makers to give the operator dual control of his fuel.



Northwestern Mixer. Lowest Priced Drum Mixer on the Market

He may use either kerosene or gasoline. By means of a super-heating attachment, introducing gas from the muffler of the engine, the kerosene is volatilized to the proper point for producing the maximum explosive power within the cylinder. There are two lead pipes from the storage tank equipped with shut-off valves, enabling the operator to draw either fuel as desired.

As NORTHWESTERN Engines are operated with gravity feed from the fuel tank, there are no difficulties to be overcome with the many small working parts of the pump. This enables users of NORTHWESTERN Twin Service Carburetors not only to buy engines at favorable prices, but also to save two-thirds of the daily cost of their fuel bills.

The sizes and models of concrete mixers offered by the Northwestern Steel & Iron Works, Eau Claire, Wis., which are equipped with the "Northwestern" Twin Service Carburetor, for the 1918 season follow closely their line of last year. Write for a copy of their Bulletin No. 29.

## Trinity Portland Cement Company Annual Meeting

The Trinity Portland Cement Company, Dallas Texas, held their annual meeting of the stockholders and directors recently. The business of 1917 was discussed and it was found to be the most prosperous year in the history of the company. Officers were elected as follows: President, W. H. L. McCourtie of Minneapolis, Minnesota; vice president, C. H. Wagner, of Minneapolis; treasurer and general manager, C. E. Ulrickson of Dallas; secretary, F. G. Ray, of Vinton, Iowa, and assistant secretary, J. O. Teagarden, of Dallas.

This company has been doing their bit in helping the government, having purchased $50,000 worth of Liberty bonds. They also have a savings society and were one hundred per cent patriotic in the Red Cross work.

## Tractors and Trailers Haul Full Carload of Crushed Stone

E. C. Dunbar, of the Dunbar Stone Company, Detroit, Mich., believes in straightforward methods of accomplishing things. Mr. Dunbar sells crushed stone—and lots of it. A heavy, bulky material, handling and hauling are the greatest problems. Labor and time-saving methods have a direct and considerable influence upon profits.

Instead of employing twenty teams with twenty drivers and fifty laborers to unload and deliver a carload of stone, Dunbar uses a clam shell bucket, a big Knox tractor, three Lee trailers and a total of five or six men to do the whole job in about one-fifth of the time.

Even in Detroit, where motor vehicles of usual and unusual design are common, these Dunbar "trains" excite a great deal of interest. Painted a bright yellow and with the word "Dunbar" in black letters two and a half feet high, their advertising value to the company is large.

The front and rear trailers of the train each have a rated capacity of ten cubic yards and the middle one eight. With the load crowned up in the center these capacities are increased to fully 12½ and 10 cubic yards, respectively, or a total of 35 cubic yards or more of stone—a full railroad carload.

Their crushing plant at River Rouge, Mich., about 17 miles from Detroit, is equipped with a 40-ton crushing roll, making 165 revolutions a minute, operated

System for Handling Crushed Rock and Sand

by independent 200-horsepower motors, a No. 9 and two No. 5 Gates crushers and two No. 5 Austin crushers. Cyclone deep-blast hole drills are operated in their quarry.

## New Supt. La Salle Cement Plant

F. B. Gerard, for over ten years superintendent of the German-American Portland Cement Company (name recently changed to La Salle Portland Cement Co.), completed his service with the plant on Feb. 15 and left for Cleveland, O., where he will become associated with the Austin Construction Company in a sales engineering position.

It was in September, 1907, that Mr. Gerard came to La Salle from Iola, Kas., to become superintendent of the La Salle cement plant. He has remained in that capacity ever since and has proven a very capable official, one the company regretted to lose.

Succeeding Mr. Gerard at the German-American plant is C. H. McClarnan, who assumed his new duties this morning.

Since coming to La Salle several years ago, Mr. McClarnan has been employed as assistant superintendent at the Marquette cement plant in Oglesby, Ill.

# Wolverine Cement Co. Adds Plant Improvements Despite Unfavorable Year

Unfavorable operating conditions throughout a large part of the year and a diminished demand for cement the latter part of the period, due to economic changes caused by the war, are reflected in the annual statement of the Wolverine Portland Cement company, Coldwater, Mich., for the year ending December 31, 1917.

"The Portland cement industry as a whole has not been as prosperous as in 1916, due to the large increase in cost of coal, labor and supplies," says the report of the directors to the stockholders. "From official figures just at hand covering results of the 11 mills operating in the Michigan district, it is shown that shipments fell below those of the previous year from 5 to 81 per cent in individual cases, the average loss being 24 per cent and our own percentage standing at 21.6 per cent."

### Coal Cost Rises 68.4 Per Cent

Inability to obtain coal of the better quality from usual sources necessitated use of Indiana and Illinois coal, which the report explains caused a production loss of one barrel of cement for each ton of coal consumed, compared with the average of 1916, while the cost of fuel shows an increase of $104,994, or 68.4 per cent over 1916, though the purchase was 5,049 fewer tons. Labor costs increased 12½ per cent and costs of repairs and supplies in greater ratio.

Offsetting only in part the higher operating costs was the advance in price of the cement, the price for which in bulk, at the mill, rose from $1.25 to $1.70 a barrel, but declined to $1.60 before the end of the year.

During the year the company bought seven and one-half acres of additional marl land for its Quincy plant, installed new coal handling equipment and additional coal-drying equipment at its Coldwater plant, and substituted a large power unit for a smaller engine at the Coldwater plant and made extensive repairs on its boats and tugs. Dividends were maintained at 2 per cent quarterly until December, when 1 per cent was paid.

# Why Require Fineness in Hydrated Lime

The current tentative standard specifications for hydrated lime of the American Society for Testing Materials require a fineness of 85 per cent through a 200-mesh screen and 99.5 per cent through a 30-mesh screen. Inasmuch as hydrated lime is an extremely fine material, there has been some wonder why such comparatively low prescriptions have been made. Norman G. Hough of the Hydrated Lime Bureau writes in explanation that the 30-mesh sieve provision was added merely to rule out limes with impurities, such as quarry sand, kiln brick dust, etc., all of which are deleterious in amounts greater than an arbitrarily placed minimum of ½ per cent. The 200-mesh provision was merely to insure a finer lime than a standard cement, which must pass 78 per cent through a 200-mesh. This insures a finer material in mortars, stuccoes, etc., where hydrated lime is mixed with cement.

# Cement Co. Declared Dividend

The Dixie Portland Cement Co., of Chattanooga, Tenn., has declared a semi-annual dividend of four per cent on common stock, making a total of eight per cent for the year. This is one per cent more than was declared last year.

# Concrete Tile and Culverts

The Northwestern Steel & Iron Works, Eau Claire, Wis., anticipates an active season on their tile and culvert forms. They point out that the use of these especially in road work effects large savings in iron and steel as well as of railroad tonnage and car space, as all of the materials generally are procurable locally except the cement and reinforcing. Another feature in their favor is the effective use of local unskilled labor. Two styles of tile made with their forms are illustrated —the concrete (without reinforcing) and the reinforced. Full information for making concrete tile is contained in their new Bulletin No. 29. Write for copy.

Reinforced Drain Pipe

Not Reinforced

# Link-Belt Electric Hoists for Quick Shipment

The Link-Belt Company, with factories in Chicago, Philadelphia and Indianapolis, and sales offices in the principal cities of the country, announces its ability to again furnish Link-Belt Mono-rail electric hoists for quick shipment. These machines are made at the Philadelphia plant, where a large additional building is rapidly nearing completion and the already excellent manufacturing facilities are being greatly increased. Both types, C-1 and C-2, can be furnished, the safe lifting capacities ranging from 1,000 lbs. to 6,000 lbs. They can be adapted for either direct or alternating current and fitted with plain hand geared cord operated motor, or a cage operated motor trolley.

There is an unprecedented demand for electric hoists and a great likelihood that the available stock will be exhausted in record-breaking time. Practically every industry is working at top-notch capacity and electric hoists are helping to expedite production. Entrance of the United States into the war serves to increase the use of such labor-saving appliances—taking the places of men who are called to the front.

It is claimed that the Link-Belt hoist is the first Mono-rail machine to employ a dynamic breaking system for controlling the lowering speed. Dynamic lowering provides the delicate variable speed control that is so essential in foundry work of this kind.

Some of the other good features of this hoist are the small amount of head room required, weather and dust-proof construction, accessibility of working parts, simplicity and ruggedness of hoist gearing, automatic oil bath lubrication, renewable bronze bushings throughout, and *safety first* construction.

The Link-Belt Company has a new electric hoist catalog on the press and will be glad to send copies on request.

## New Book

**Eye Hazards in Industrial Occupations** (Octavo, 150 pp., illus.)

By Gordon L. Berry, Field Secretary, National Committee for the Prevention of Blindness, with the co-operation of Lieut. Thomas P. Bradshaw, U. S. Army, formerly Technical Assistant to the Director of the American Museum of Safety. Published by the National Committee for the Prevention of Blindness, 130 East 22nd St., New York. Price, 50 cents.

In this volume the author reviews the chief industrial hazards to eyesight in the industries of the United States. Case reports illustrate each section, the special dangers are described and recommendations made for such changes of working conditions or installations of protective devices, as have been found suitable for protecting workers. The book is most completely illustrated.

The following section headings indicate the scope of the book: Statistics of Eye Accidents, Chipping Operations, Machine Operations, Abrasive Wheels, Sand Blasting, "Mushroomed" Tools, Riveting, Radiations from Intense Light and Heat Sources, Ultraviolet Rays in Illuminants, Radiant Energy in Arc Welding and in Molten Metal, Metallurgic Operations, Glassblowers' Cataract, Infections, Gage Glasses, Acids and Chemicals, Treatment of Acid Burns, Industrial Poisons, Removal of Dangerous Fumes, Vapors and Gases, Spray Process Hazards, Methyl Alcohol, Bottling Accidents, Mining and Quarrying, Agricultural Hazards, Goggles, Garment Trade Hazards, Industrial Lighting, the Safety Movement.

These subjects have been treated not so much in the way of a technical manual for safety engineers, but rather in a general informative way for the information of the average manufacturer or layman who is seeking information of this nature. Descriptions of many of these hazards have been included heretofore in publications covering the complete field of industrial accident prevention, and where discussion of preventive measure would be repetition, the author has referred his reader to the chief of those sources where such detailed information might be secured, if desired.

Much of the "laboratory work" in the preparation of this book was accomplished in Buffalo, N. Y., where at the invitation of a large group of leading citizens a study was made of the eye hazards and methods in vogue for accident prevention in representative industries of that typical manufacturing city.

The book is the most complete compilation of material relating solely to the prevention of eye accidents that has been published in this country. Inasmuch as there occur annually in the United States alone nearly 200,000 eye accidents, from which many cases of total blindness result, it would seem that there is need for further attention to this important subject.

## The Ideal Drive for Cement Mills

The Ideal Drive for Cement Mills is the title of a new booklet issued by the Link-Belt Co., Chicago, paper, 6″ x 9″, 16 pp., two colors, illust. The problem of proper drives for cement mill operation is always worth consideration. This booklet deals with this subject as applied to chain drives and describes in considerable detail the installation in the mill of the Nazareth Cement Co. of 1915.

## Cement Firm Names Officers for New Year

Directors and officers of the Oregon Portland Cement company, Portland, Oregon, for the ensuing year were elected last week. There were no important changes from last year's staff. The control of the stock at the meeting was in the hands of a committee of proxy holders, Edward Cookingham, J. C. Ainsworth and Franklin T. Griffith.

The following were elected: R. P. Butchart, of Victoria, B. C., president; M. J. Ballard, of Portland, vice president; A. King Wilson, George Lawrence, Chester V. Dolph, A. S. Pattullo and L. C. Newlands, of Portland, and Clark Moore, of Denver, directors; George Macdonald, of Portland, secretary.

Financial reports submitted are said to have been quite satisfactory to the shareholders.

## Oil Storage Tanks of Concrete

Concrete tanks for storing fuel and light oils, gasoline and benzine, are being very successfully used by many manufacturers, railroads, refining and power companies, according to data compiled by the Portland Cement Association, 111 West Washington St., Chicago.

## Tanks of Concrete

Testimony from those who know that concrete meets all requirements for tanks and standpipes, with illustrations, is the contents of a booklet entitled "Why Not More Concrete Tanks," just published by the Portland Cement Association, 111 West Washington St., Chicago.

## Dividends Declared

Santa Cruz Portland Cement Company, Davenport, Calif., and the Standard Portland Cement Corporation, Napa Junction, Calif., held their regular dividend meetings recently and declared the customary dividend of $1.25 a share on the Santa Cruz stock and 75 cents a share on the stock of the Standard.

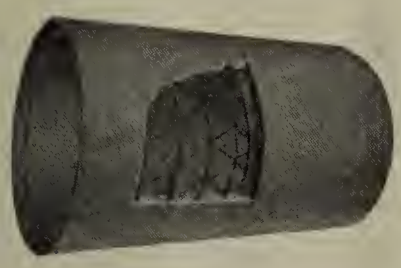
**FOR SALE**

One 3-spindle belt driven concrete bar twister. Will handle any size bars. Complete and in good condition.

WITHEROW STEEL COMPANY
212 Keystone Building
Pittsburgh, Pa.

**DANIEL B. LUTEN**
INDIANAPOLIS
*Designing and Consulting Engineer*
*Reinforced Concrete Bridges Exclusively*
Associate Engineers in each State

# SAVING—SERVICE



REINFORCED

## For Storm and Sanitary Drainage

Build for all time. Use concrete. This year you also serve the NATION by saving iron and steel, reducing railroad tonnage and conserving car space. Learn about the utility of concrete.

**USE**

"NORTHWESTERN" Tile and Culvert Forms

They enjoy an enviable reputation with the U. S. Government; State, County and Municipal Road Officials and reputable drainage engineers everywhere.

Made in standard and special sizes—round or elliptical forms.

Ask us for Bulletin No. 29. It contains full instructions for making "NORTHWESTERN" Concrete Tile.

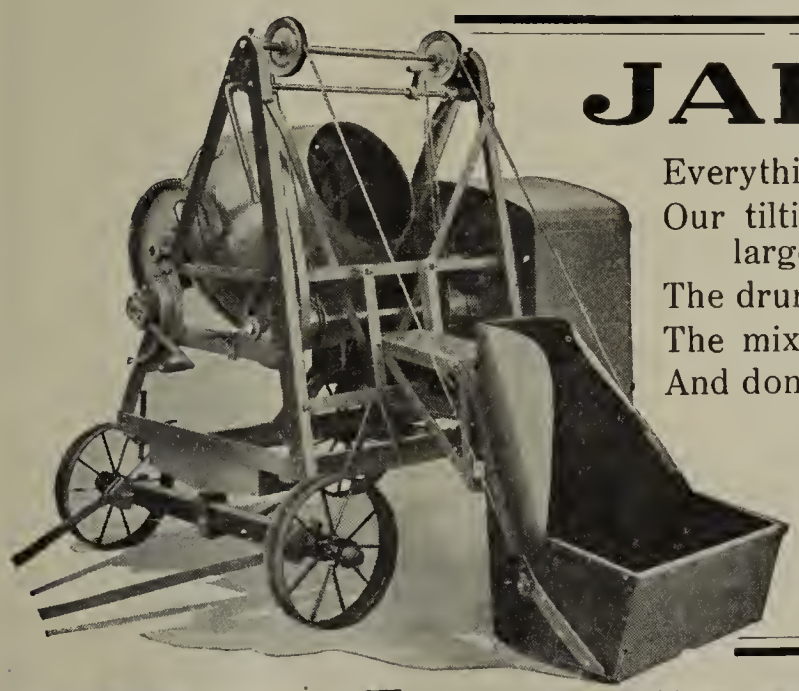
## Northwestern Steel & Iron Works

**Capital Stock $200,000.00**

**"The House of Good Service"** **EAU CLAIRE, WIS.**

**"NORTHWESTERN" TILE AND CULVERT FORMS**

CONCRETE



# JAEGER MIXERS

Everything a batch mixer ought to have is contained in this machine.

Our tilting drum guarantees a perfect speedy mix—single opening, large capacity easy to load and unload and always clean.

The drum is entirely open to view at all times.

The mixer has proven by test to be the most economically operated.

And don't forget you get a mix a minute.

*WRITE TODAY FOR NEW FOLDER OF ENTIRE LINE*

## The Jaeger Machine Co.

**212 W. Rich St.** **Columbus, Ohio**

# Packard LOW CHARGER

The "Easy to clean," Patented **"High Speed"** Mixing and Discharge Action is one of the few that **successfully** and **fast** handles

**STIFF CONCRETE FOR CURBS, GUTTER AND SIDEWALK WORK**

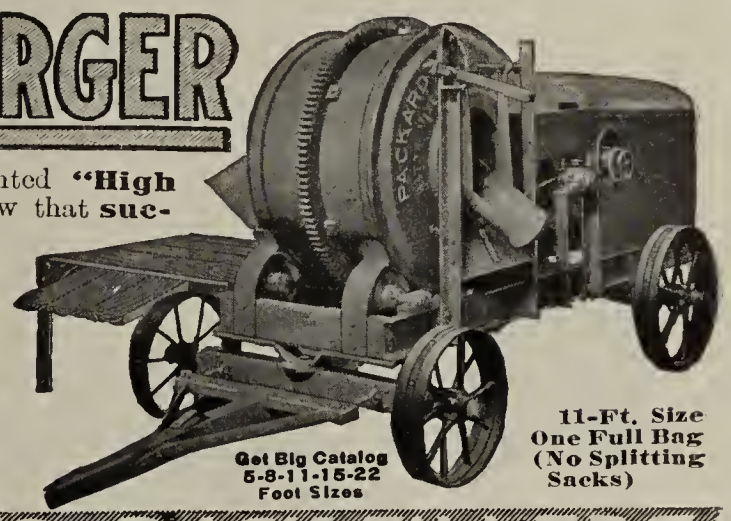
Get our astonishingly low prices on these sturdy, built-of-steel mixers—also our Terms. 6 and 11-ft. sizes—also with Loaders. Quick deliveries from stock carried in all large cities. Write nearest office

*The* American Cement Machine Co Inc

Keokuk Iowa

THE 300,000 HP ELECTRIC CITY

BRANCH OFFICES—New York, N. Y.; Cambridge, Mass.; Richmond, Va.; Pittsburg, Pa.; Cleveland, O.; Indianapolis, Ind.; Louisville, Ky.; Chattanooga, Tenn.; St. Louis, Mo.; New Orleans, La.; Chicago, Ill.; Minneapolis, Minn.; Denver, Colo.; El Paso, Tex.; San Francisco, Calif.; Seattle, Wash.; Spokane, Wash.



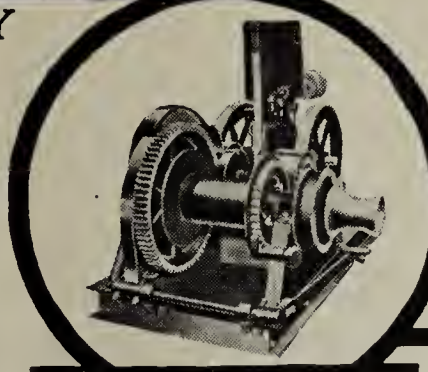

Get Big Catalog 5-8-11-15-22 Foot Sizes

11-Ft. Size One Full Bag (No Splitting Sacks)

**PAVERS—GROUTERS—HOISTS—BACK FILLERS**

**Boss "HEAVY DUTY" Contractors' Hoists**

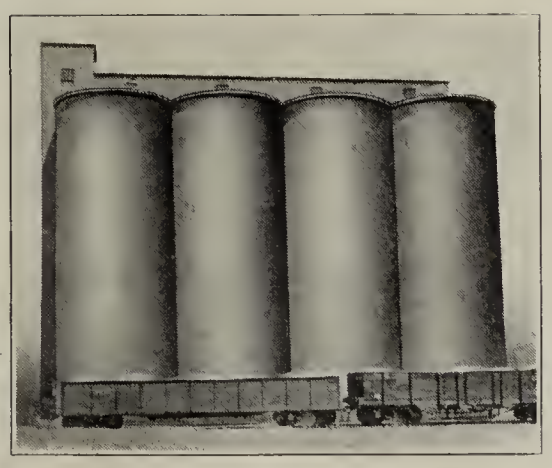
Gasoline—Kerosene or Electric Power—reliable as steam. Absolutely dependable. $5 to $10 a day cheaper to operate. Three sizes—6, 8, 10 H.P. Three speeds—100, 150, 200 ft. Rope Travel. Hyatt Roller Bearings. Prompt Deliveries. Write, wire or 'phone nearest branch office.



Over 100 Ordered for USE "SOMEWHERE IN FRANCE"

**THE AMERICAN CEMENT MACHINE CO., Inc., Keokuk, Iowa.**

BRANCH OFFICES—New York, N. Y.; Cambridge, Mass.; Richmond, Va.; Pittsburg, Pa.; Cleveland, O.; Indianapolis, Ind.; Louisville, Ky.; Chattanooga, Tenn.; St. Louis, Mo.; New Orleans, La.; Chicago, Ill.; Minneapolis, Minn.; Denver, Colo.; El Paso, Tex.; San Francisco, Calif.; Seattle, Wash.; Spokane, Wash



## Eleven Bin Stock House

Erected for the

**Ft. Dodge Portland Cement Co.**

GILMORE CITY, IOWA

Let HOAG Build your Stock House

## D. F. HOAG & CO.

**Engineers and Builders**

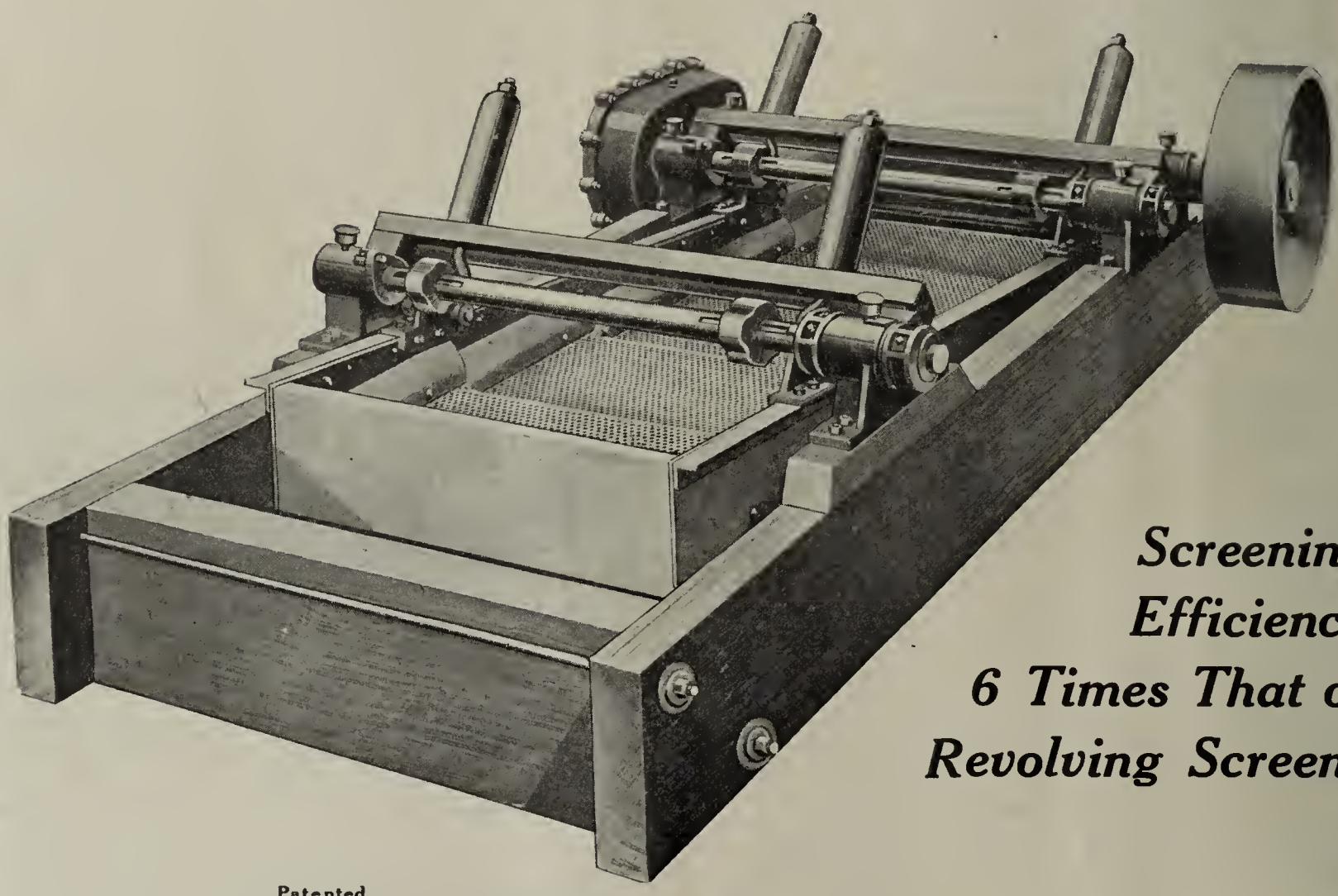
**202-4 Corn Exchange** - - **MINNEAPOLIS**

# SYMONS
# Pulsating Screens

FOR SCREENING ROCK SAND OR GRAVEL

## COST LESS THAN REVOLVING SCREENS

Occupies one half the floor space.
Screen surface easily replaced.
Small amount of power required.
Greater screening area.
Snappy motion eliminates blinding.



***Screening Efficiency 6 Times That of Revolving Screens***

Patented.

We guarantee quick shipment. Tell us what you want to screen and we'll tell you what you need.

MANUFACTURED AND SOLD ONLY BY

# CHALMERS & WILLIAMS

(INC.)

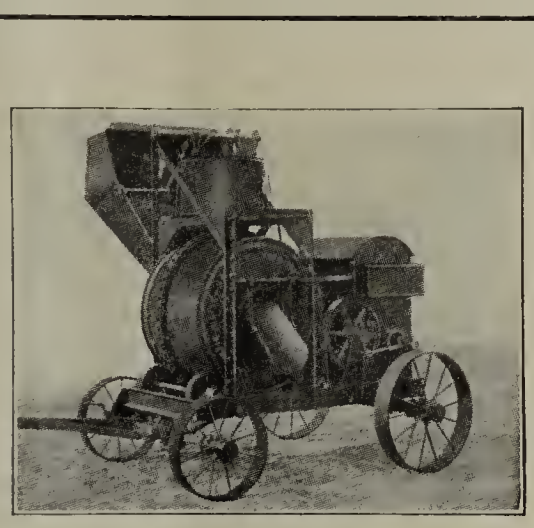
CHICAGO HEIGHTS, ILLINOIS

# AUSTIN

## *The One Prime Requisite*

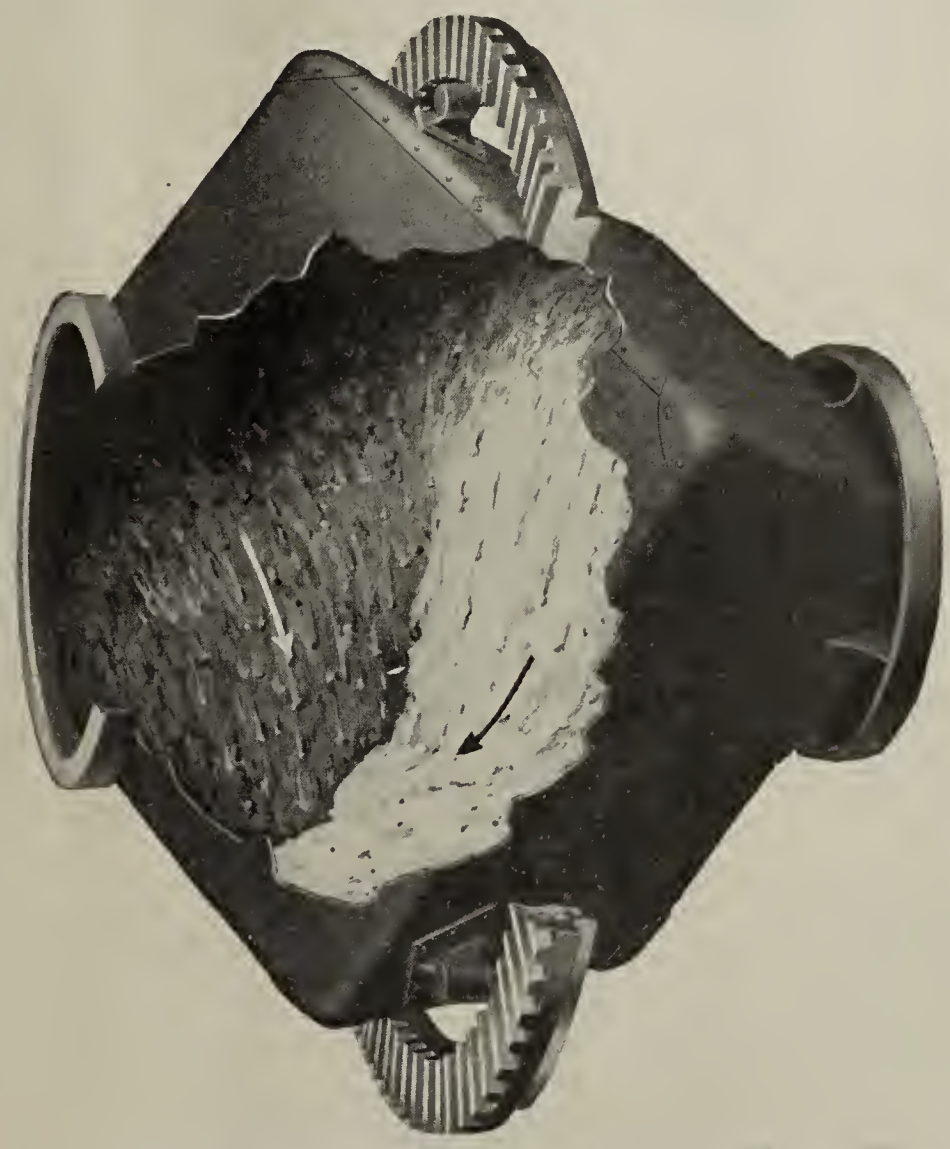
of a Money-Making Concrete Mixer is the ability to Mix Scientifically.

Say all you please about operating speed, efficiency, dependability, etc., the one thing you require of a mixer first, last and all the time is the ability to produce in the shortest time the best possible concrete with the materials and proportions available. That's scientific mixing — and although it costs more to buy, you can't get maximum return without it.



For those who are satisfied with the "blade" type drum the Austin Drum Mixer is a most logical piece of equipment. Nowhere has it found its equal in round drum mixers.

**If a mixer of this type is desired ask for Catalog 21-D**



## AUSTIN CUBE MIXERS

mix by kneading the mass as a unit. Study the cube. Imagine it to revolve. Note the zig-zag travel of the center line and how the alternating angle of each opposite side, as it comes up, folds the upper portion of the mass over upon itself, always toward and past the center.

That's scientific mixing.

That's "Cube" mixing.

That's the greatest money-making feature known in mixer design.

And that's why you could afford to pay for a "Cube" almost double the price of an ordinary drum mixer.

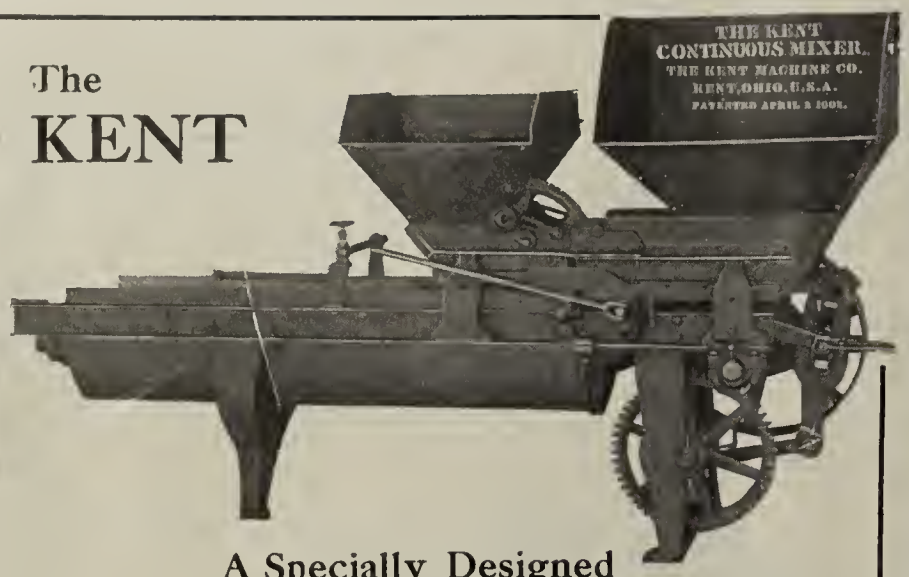
If you want to know more about "Cube" mixing just ask for Catalog No. 21

# F. C. AUSTIN COMPANY, Inc.

***The Products of Municipal Engineering & Contracting Company are now being marketed by us.***

**Main Office Railway Exchange, Chicago** **New York Office, 30 Church St.**

The KENT




A Specially Designed

## Mixer for Products Plants

Seventy per cent of the bigger block, tile, brick and specialty concrete products plants of the country use the famous Kent Mixer.

Equipped with automatic feeding device, it makes certain a proper proportioning of aggregates and being continuous in operation, it saves time and labor. The biggest concrete products plant in the world has found that four Kent machines will mix fast enough to keep its many tampers and mold machines busy.

**Write today for descriptive literature and prices.**

## THE KENT MACHINE CO.
Kent, Ohio



## The Biggest Tile Business on Record

Get action now. Big spring buying of drain tile will start soon—and it will be the biggest on record. Cement tile is needed wherever farming is done. Thousands more tile plants are needed to fill the demand.

Equipment must be selected and installed, manufacturing perfected, and a stock of tile made up—all within the next few weeks. Enlist our co-operation.

Dunn equipment is standard. It represents the minimum necessary investment, is sold on a strict guarantee to satisfy, and on 15 days' trial. Ask for the book, "Cement Drain Tile"; we send it free.

## W. E. DUNN MFG. CO.
414 24th Street HOLLAND, MICH.

*"Stonekote" residence at Hinsdale, Ill.*

## "Stonekote" Rough Cast

The only cement plaster for all exterior surfaces—rough cast, float coat, trowel finish, or polish finish. As hard as natural stone; made in ay non-fading color desired. Stonekote is shipped as a dry material; any mechanic can mix and apply. It is the only perfect waterproof and wear-resisting plastic finish to give permanent and delightful results.

*Write for Booklet*

## Garden City Sand Co.
25 North La Salle Street
CHICAGO, ILL.



## POLK SYSTEM

Concrete grain bins, water tanks, coal pockets and silos built by the POLK SYSTEM mean a big, growing business for the contractor. Why waste *your* time at *odd jobs* that *don't pay*. Be fair to yourself. Investigate the POLK SYSTEM. Write

## POLK GENUNG POLK COMPANY
706 Fisher Building CHICAGO



CALDWELL'S HELICOID

HELICOID Screw Conveyor is heavier, stronger and better made than any other. Requires fewer repairs—no lapped and riveted joints to come apart—flight all one piece. Special hangers, bearings and boxes for cement work. If you have anything to do with the manufacture of cement, you should write for our Catalogue.

Elevating, Conveying and Power Transmitting Machinery.

## H. W. CALDWELL & SON CO.
17th Street and Western Ave., CHICAGO
NEW YORK, Fulton Bldg., Hudson Terminal, 50 Church St.
DALLAS, TEXAS, 711 Main St.

The Plymouth Hauling Concrete for Foley Bros., Welch, Stewart & Fauquier

# "Saves Yard Haulage in Contract Work"

## —Says McArthur

Foley Bros., Welch, Stewart & Fauquier, general contractors, Halifax, N. S., have two Plymouths employed constantly in general yard switching and hauling concrete on the job. C. D. McArthur, chief engineer for this firm, found that—

## The Plymouth
### Friction-Drive Gasoline Locomotive
### Cuts Haulage Costs One Half

It costs less to buy, less to install, less to operate, and less to maintain. It takes heavier loads up-grade, uses full power of motor in high or low speeds, goes at ALL speeds up to 12 miles, and moves quicker without jerk or jar.

*MR. McARTHUR PROVES ALL THIS*

"The Plymouth Locomotives are entirely satisfactory to us," he says. "We find them of great help in our yard work and we find it would be hard work to get along without them."

**THIS BOOK TELLS**

We have a book that tells the complete story of these contractors as well as other owners of Plymouths. It is also full of cost data and valuable information regarding haulage problems similar to your own. A copy for the asking—send for it today.

**THE J.D. FATE CO., 220 Riggs Ave., PLYMOUTH, OHIO**

# IMMEDIATE DELIVERY

"Franklin"

ROUND—SQUARE—FLAT—SQUARE TWISTED

## STEEL BARS
### for CONCRETE REINFORCEING

We can meet your Reinforcing Steel Requirements. This means not only quick shipment from the mills but co-operative service for rapid transportation. If you want to know just what your exact cost will be, send us the Blue Prints and we will give you a lump sum bid on all the steel sheared to lengths, bent to specifications and delivered to the job,

***Our Engineering Department is at your service.***

## The FRANKLIN STEEL WORKS
### FRANKLIN, PENNA.

Cleveland, 1320 Rockefeller Bldg.
Boston, - - 12 Pearl Street
Philadelphia. 2215 Race Street
New York, - 30 Church Street
Chicago, - - 332 So. Michigan Blvd.
Buffallo, - Erie County Bank Bldg.
Pittsburgh, Oliver Bldg.

QUALITY SERVICE

# The Waterloo Bar Bender will pay for itself on the first job

No. 2 Machine Bends to including 1⅛" Bars, weighs 110 lbs. Price.....$20.00
No. 3 Machine Bends to including 1½" Bars, weighs 210 lbs. Price..... 25.00
Machine Stand weighs 90 lbs. Price..... 10.00

The price of this bender is returned to you in time and money saved on your first job, and the machine itself is indestructible, so you multiply this saving year by year.

Makes bends at various angles to meet any design. Bending **posts of turned steel. The post that revolves through the slot in the plate is equipped with loose steel roller to keep bar from creeping during bending. Machine is furnished with detachable handle 7 ft. long. No. 2 machine is especially adapted for field work.**

**Waterloo Construction Co., Waterloo, Iowa**

# Inland Deformed Bars

In Open Hearth Steel (New Billet Stock), Hard Grade, and Rail Carbon Steel (Rerolled).

The mechanical bond is theoretically correct and is guaranteed by us, having been designed by expert concrete engineers and approved generally by engineers and architects.

The corners are rounded to prevent splitting of the concrete. Bending, fabricating and setting are easily done with these bars. Sizes ⅜ to 1¼ inch. Lengths up to 85 feet.

Prompt shipments during 1918.

**INLAND STEEL COMPANY First National Bank Bldg., CHICAGO**

# Stroh Process Gears and Pinions—

*WEAR LONGER—*

***Reduce the repair account and Increase the tonnage.***

Where the service is heavy and would quickly wear out other materials, Stroh Process Castings show a remarkable economy.

*A definite cash refunding guarantee is given with a trial order.*

May we send you our booklet telling of the Stroh Process and its achievements? You will find it intensely interesting and, we believe profitable also.

**STROH Steel-Hardening Process Co.**
**PITTSBURGH, PA.**

F. LLOYD MAFK, Western Sales Manager, Monadnock Bldg., CHICAGO

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**Fuller Face Hardened Sprocket and Traction Wheels**

Unequaled for severe duty. Proven by test. Their use prolongs the life of chain.

RESULTS:—Increased Efficiency—Saving in Operating Cost.

We manufacture all kinds of wearing parts subjected to abrasion.

*Write for Fuller Quality Products Catalog No. 50—C*

LEHIGH CAR, WHEEL & AXLE WORKS, :: CATASAUQUA, PENN.
NEW YORK, N. Y., 50 Church St. PITTSBURGH, PA., Farmers Bank Bldg. CHICAGO, ILL., McCormick Bldg.

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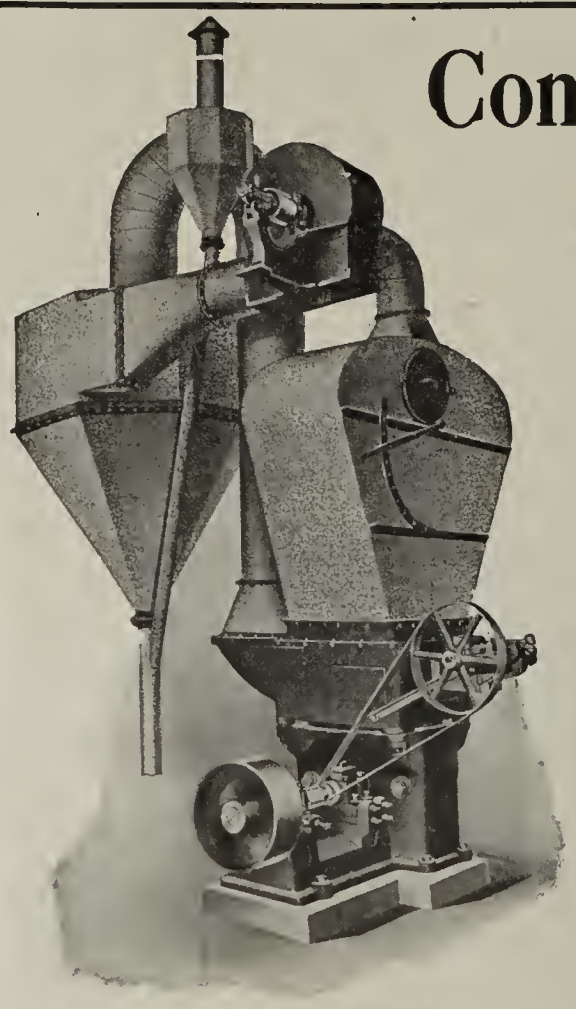

# Complete Grinding

IN ONE

# MACHINE

In successful use grinding Cement, Clinker, Limestone, Coal

INSTANT REGULATION OF FINENESS

NO DUST

*Send for circular*

**THE BONNOT CO.**
CANTON, OHIO

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# *Schlueter Rapid Floor Surfacer*

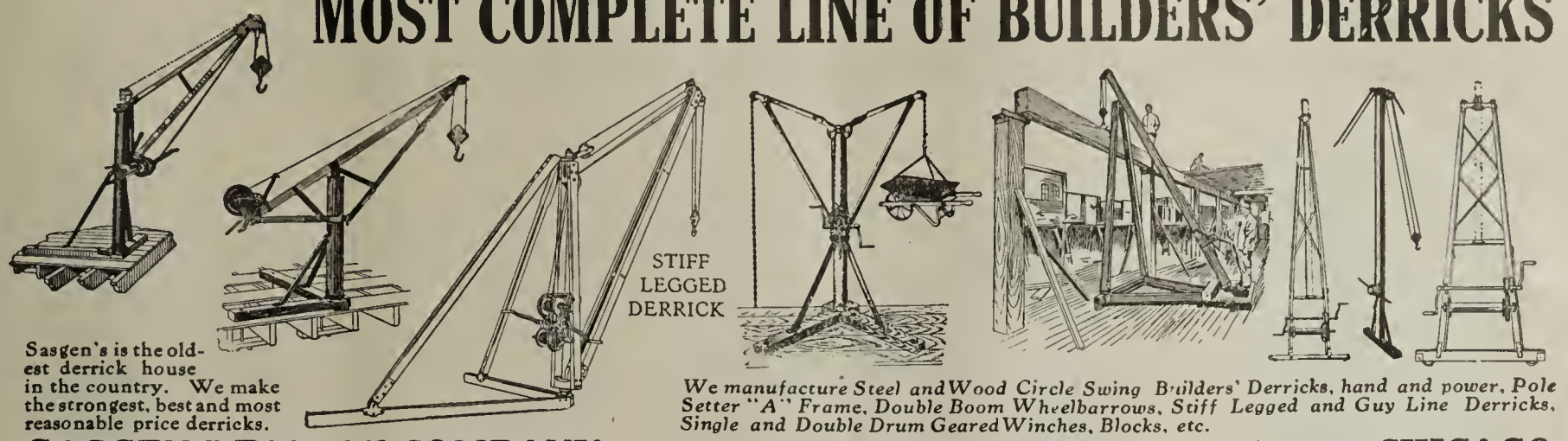
The Schlueter BALL BEARING electric floor surfacing machines for mosaic, marble, composition and wood floors are the most simply constructed machines on the market. Direct chain drive Automatic Dust Collectors.

**Over 5,000 in Use All Over the World**

Send for Prices and Free Trial Proposition

**M. L. SCHLUETER CO.**
225 W. Illinois Street, CHICAGO

# MOST COMPLETE LINE OF BUILDERS' DERRICKS




Sasgen's is the oldest derrick house in the country. We make the strongest, best and most reasonable price derricks.

*We manufacture Steel and Wood Circle Swing Builders' Derricks, hand and power, Pole Setter "A" Frame, Double Boom Wheelbarrows, Stiff Legged and Guy Line Derricks, Single and Double Drum Geared Winches, Blocks, etc.*

**SASGEN DERRICK COMPANY, Grand and Albany Aves., CHICAGO**

**WRITE FOR CATALOG No. 15**

# ADAMANT SILICA TUBE MILL LININGS
# GRINDING PEBBLES

Have successfully passed some of the most severe tests. Long life and moderate price. Immediate shipment on stock sizes. Write for prices.

**Jasper Quarry Co., Sioux City, Iowa**

## EXCEPTIONAL OPPORTUNITY

# Complete Cement Plant

## Capacity 750,000 Bbls. Annually

**LOCATION, BEDFORD, IND.**

We own and offer for sale the above plant and offer it either as a whole or in part. Quotations will be made on any parts desired. Buildings:

| | |
|---|---|
| Raw Material Building | 130x135 ft. |
| Raw Material Annex Building | 43x 90 ft. |
| Rotary Kiln Building | 95x180 ft. |
| Coal Drying and Grinding Bldg. | 58x 80 ft. |
| Dry Grinding Building | 90x114 ft. 5 in. |
| Storage Warehouse | 80x250 ft. |
| Boiler and Power House | 91x100 ft. |
| Repair Shop | 30x119 ft. |
| Coal Storage Building | 25x100 ft. |

All buildings structural steel with brick walls.

2—300 H.P. Cahall Vertical Water Tube Boilers.
4—250 H.P. Geary Water Tube Boilers.
1—375 H.P. Heine Boiler.
All 160-lb. pressure.
1—1000 K.W. Vertical General Electric-Curtis Turbo-Generating Set.
1—800 K.W. Vertical General Electric-Curtis Turbo-Generating Set.
Both sets 3 phase, 25 cycle, 480 volts; one complete switchboard panel for the above, also condenser for the turbines, circulating pumps—everything complete and now in position.
20—10-ton steel hopper dump cars.
2—Austin No. 6 Gyratory Late Type Crushers, with elevators, screen, etc.
1—60 in. x 50 ft. Moser Dryer.
2—60 in. x 40 ft. Sinker Davis Dryers.
1—Allis-Chalmers set of Anaconda Rolls, sizes 40x15 in.
3—5x22 ft. Gates Tube Mills.
32—30-in. Griffin Pulverizing Mills.
10—Allis-Chalmers Rotary Kilns, 7 ft. to 5 ft. 6 in. x 60 ft., complete with Automatic Kiln Feeder Boilers. coal pulverizing equipment, etc.

Besides the above, the plant is equipped with all the necessary conveyors for material, elevators, all copper wire for transmitting current, laboratory complete, office buildings, stone quarry, shale quarry, sidings, workmen buildings and approximately 325 acres of Real Estate.

*For Prices and Full Particulars Address*

**McCOY-BRANDT MACHINERY COMPANY**

**216-218 Penn Avenue, Pitsburgh, Pa.**

# SHEARER & MAYER DRAGLINE CABLEWAY EXCAVATOR

(PATENTED)

Digging
Boulders and Gravel

Conveying and Elevating to
Screening Plant

A simple, efficient, rapid and economical machine known for its wide area of operation and efficient excavation of material from either wet or dry pits. Digs, conveys a distance of 500 feet or more. Elevates and dumps the material into bin, screens, cars, wagons or storage piles.

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CALDWELL Silos practically sell themselves. They are storm-proof, water-proof, air-proof, acid-proof, fire-proof, vermin-proof — altogether, trouble-proof. Each stave is a wet mixed reinforced stave having $\frac{3}{8}$" bar of twisted steel placed diagonally in the concrete. And each stave interlocks with the six adjoining staves; is crossed and held in place by three external bands. Caldwell Silos are permanent, moderate priced and favorites with the farmers.

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CO-OPERATIVE CONCRETE CONSTRUCTION COMPANY
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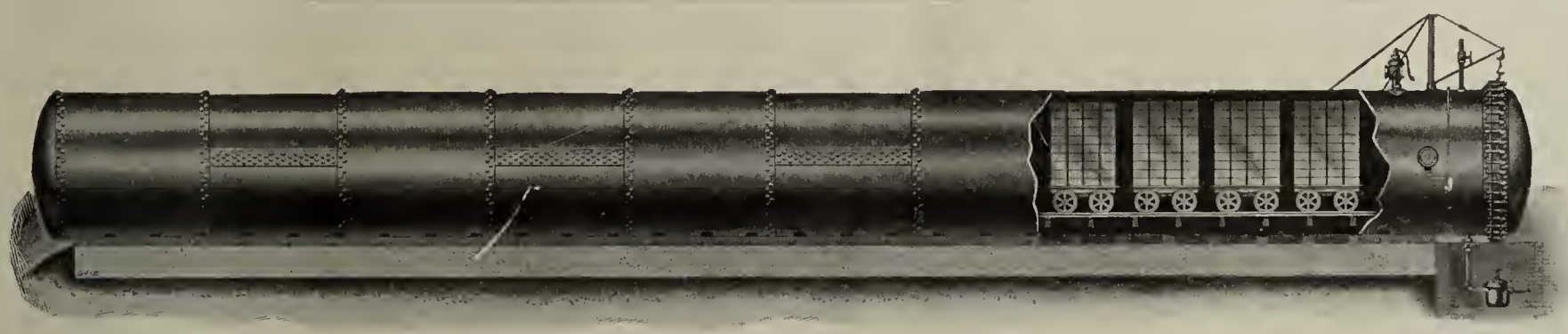
Our complete line of Sand Lime Brick Machinery makes it possible to secure just that machinery which is required to make your plant a success. We favor no particular type of machinery but are guided by the needs of the customer. Our wet and dry grinding mills have transformed a number of unsuccessful plants into dividend producers, while our Presses, Mixers, Hardening Cylinders and other equipment are of equal quality. We can exactly meet the demands of any manufacturer with a quality of machinery which will operate at a profit with a minimum amount of attention and expense.

*Correspondence solicited*

## The American Clay Machinery Co.

WILLOUGHBY, OHIO



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The High Cost of Power Is Reduced to a Minimum By the Use of a

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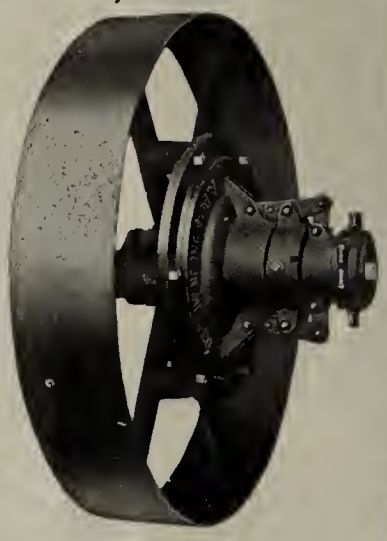
The power of this clutch is unusual. The double toggles on this clutch develop such tremendous pressure that even on the largest clutches only a hand lever is needed to engage or disengage the clutch. The geared devices usually needed to operate large clutches are unnecessary.

This is only one of the practical advantages the cement mills find in this clutch. Write for our catalog and learn the rest of them.



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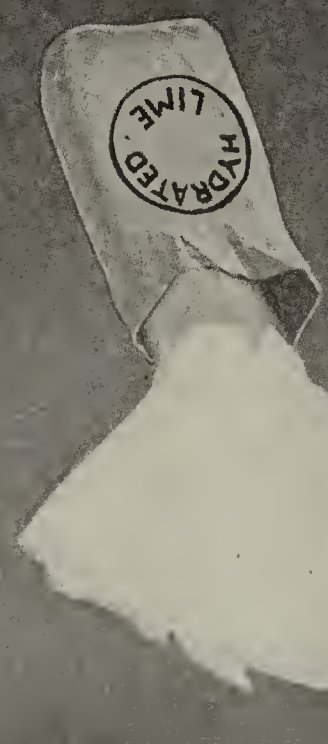


## SHOOTING CONCRETE 4,000 FEET

Out at San Francisco the Twin Peaks Tunnel is being built by R. C. Storrie & Co. It passes through water bearing soil and City Engineer M. M. O'Shaughnessy specified Hydrated Lime in the concrete to make the structure waterproof, eight pounds of hydrate being used to one hundred pounds of cement; the concrete proportions being 1 cement, 2¼ sand and 5 crushed gravel, graded from ¼ to 1¼ inches.

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"On this work the pneumatic concrete placing system is used and we have shot the concrete twenty-six hundred feet through eight-inch pipe and expect to extend this line to four thousand feet or more; the lime being a great help as a lubricant. Where chutes are used they can be much flatter and will carry the concrete much farther with lime in the mix; in fact we have used lime for this purpose and for easier placing in narrow walls and around reinforcement, even when not specified, on account of the labor saved.

"The uniformity of the concrete on this piece of work and the absence of honeycomb patches can be greatly attributed to the use of Hydrated Lime."

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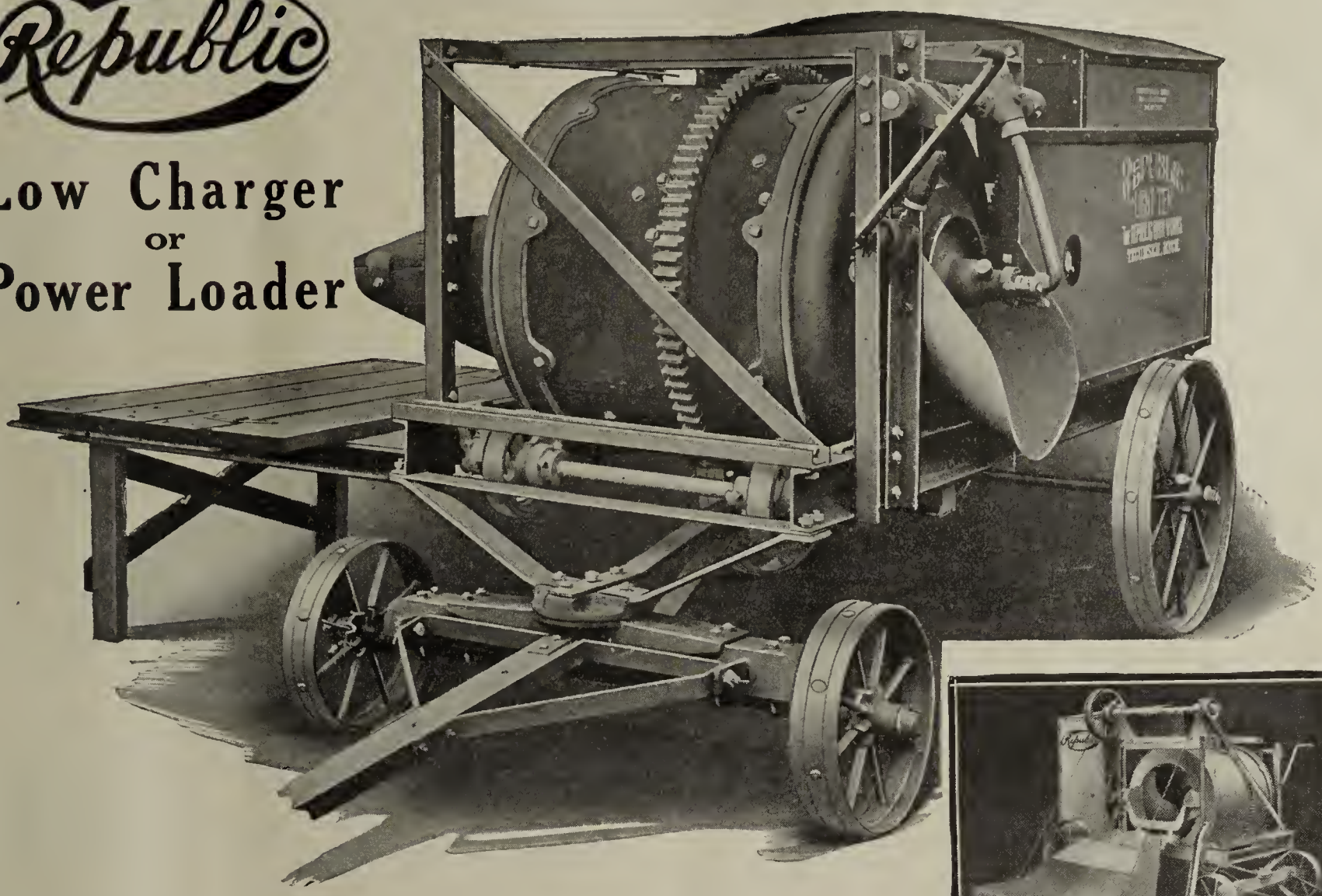

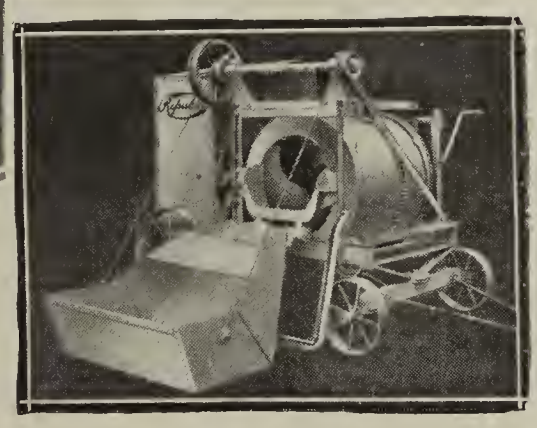

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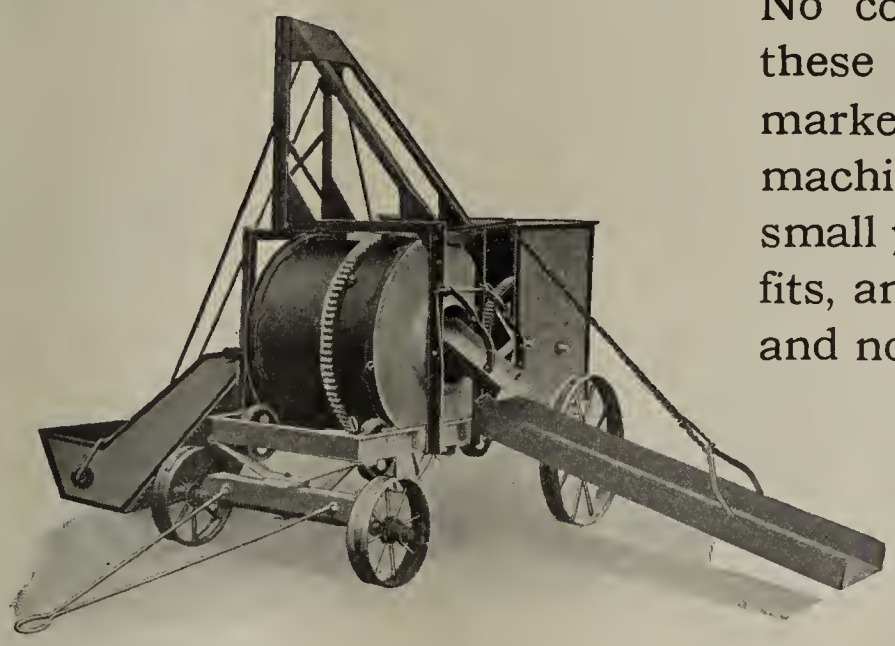

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Richard K. Meade.
F. L. Smidth & Co.
Soper Engineering Co.
Preston K. Yates.

### Excavators (Drag Line Cableway)
Sauerman Bros.

### Filters (Water)
Wm. B. Scaife & Sons Co.

### Fuses—Blasting
Ensign-Bickford Co.

### Gears
Foote Bros. Gear & Machine Co.
Ganschow Co., Wm.
A. Plamondon Mfg. Co.
Stroh Steel Hardening Process Co.

### Kilns
Allis-Chalmers Mfg. Co.
Traylor Eng. & Mfg. Co.
Worthington Pump & Mchy. Corp.

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Geo. Haiss Mfg. Co.
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Link-Belt Co.

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### Metal Wheels
French & Hecht.

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Standard Motor Truck Co.

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### Silo Forms (Monolithic)
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Fischer & Hayes Rope Co.
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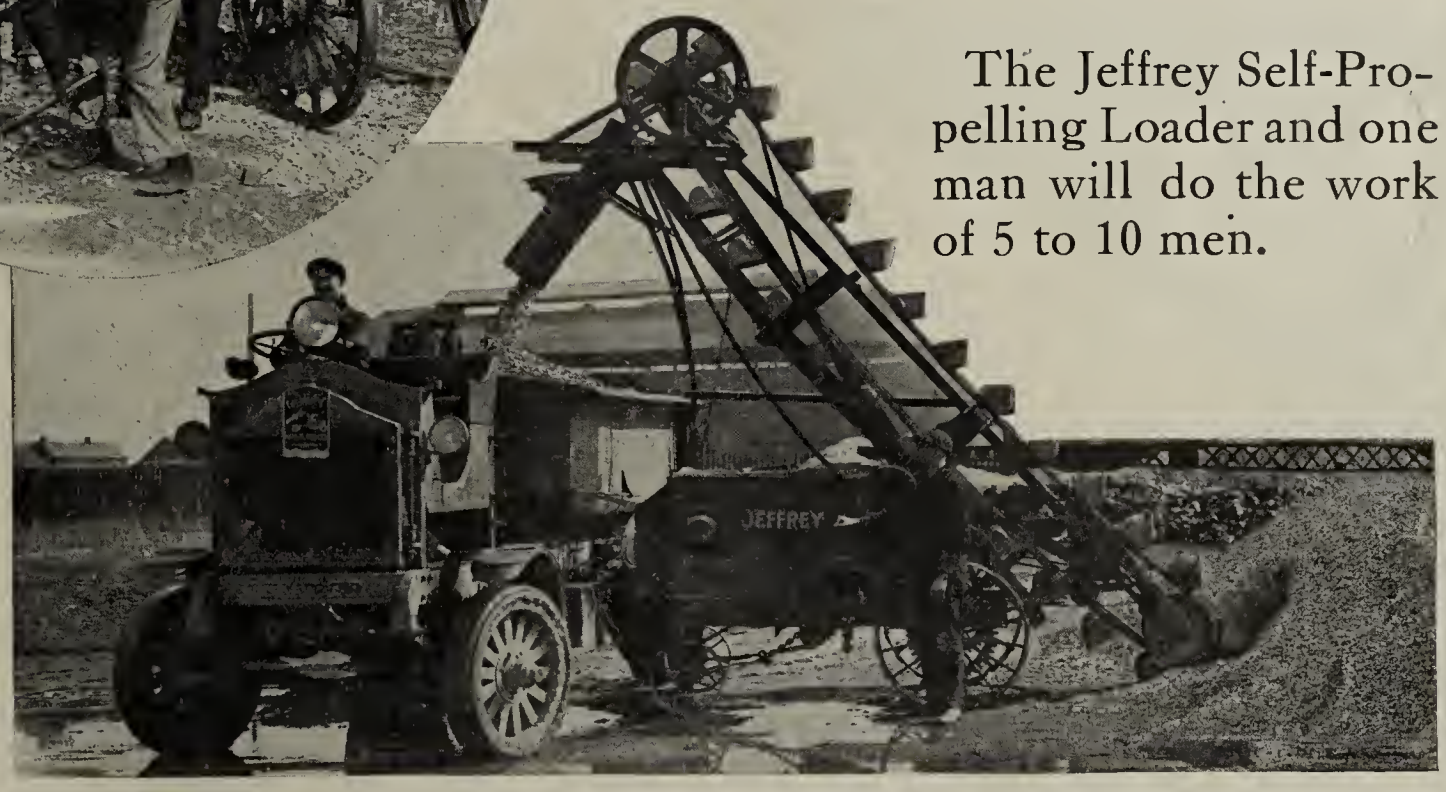
# Save the Wages of the Shovel Gang




The Jeffrey Self-Propelling Loader and one man will do the work of 5 to 10 men.

## WHAT YOU GET IN THE JEFFREY LOADER

Self Propelling One-Man Control—practically fool proof and easily operated by the ordinary yard laborer—Digs and loads 1 to $1\frac{1}{2}$ cubic yards of sand, gravel or crushed stone, ashes etc., or 1 to $1\frac{1}{4}$ tons of coal per minute. Handles stone up to $3\frac{1}{2}$ inch ring—coal up to 6 inch cubes. Frame is collapsible, permitting elevator to be quickly lowered to clear obstructions.

OVER 400 Jeffrey Self-Propelling Loaders are paying for themselves over and over for contractors, pits, quarries, building supply dealers, industrial plants, etc.

**Write for Interesting Loader Bulletin No. 177-L**

**THE JEFFREY MANUFACTURING CO.**

914 North Fourth Street — COLUMBUS, OHIO

# Attaining The Maximum In Output and Economy

## Finally Narrows Down To The Adoption of-

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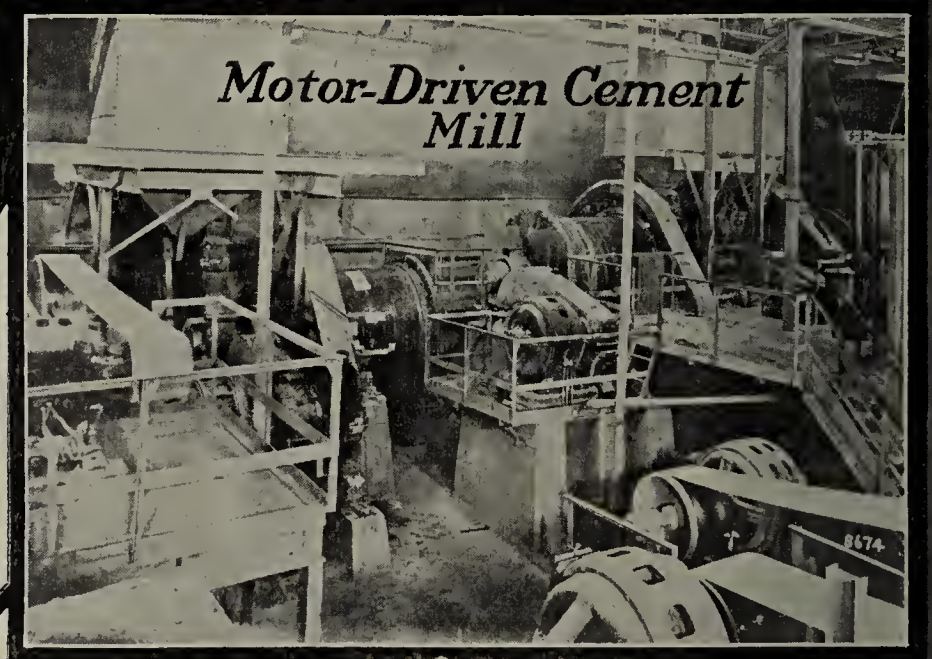
WESTINGHOUSE ELECTRIC

*Westinghouse Motors and Control*

*Increase production, are economical in the use of power, and lower maintenance costs.*




The war is showing us the faults of the past, and is leading us to newer methods and higher efficiencies.

The Cement plant is no exception. Greater speed and efficiency is needed. Many have already taken the forward step and are reaping the benefits of Westinghouse Electric Drive.

You will not attain your maximum until you adopt Electric Drive.

**Westinghouse Electric & Mfg. Co.**

East Pittsburgh, Pa.

# Westinghouse —Electric Drive

# Have You Investigated?

Half Bag Archer Mixer Delivering Direct Into Forms on Sewer Conduit Work

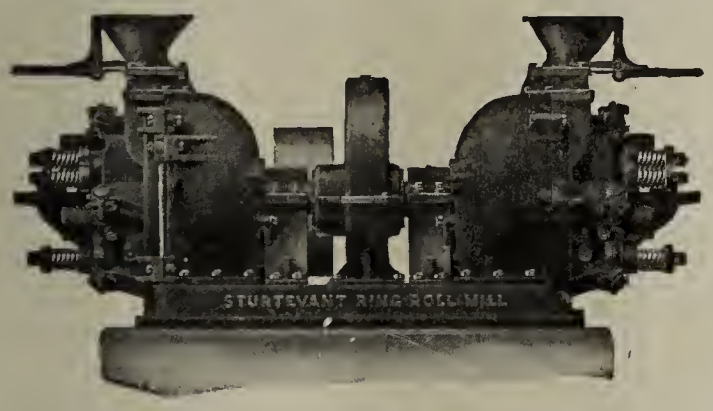
## Archer Mixers Are Proven Leaders

Do you want a mixer that will save you time on every job—a mixer that will enable you to get more work done with a smaller gang? Do you want a mixer that will save you so much that your extra profits will more than pay for the machine on your next job—or that will enable you to get more work by figuring lower? Then you must get the ARCHER—the original end discharge mixer.

Residences and farm buildings will constitute the majority of work next year. In this field the "half bag" ARCHER is, without question, unequalled.

**Let the ARCHER, Itself, Show You by Its Work How Much Better it is for You in Every Way. Write for "SHOW ME" Offer**

**Archer Iron Works,** 2514 W. 34th Place, Chicago




## STURTEVANT RING-ROLL MILL

**For CLINKER, LIMESTONE and COAL**

THE LARGEST PRELIMINARY GRINDER BUILT

CAPACITY PER HOUR ON CLINKER

80 TO 120 BBLS. TO 20 MESH WITH 80—90 H. P.
50 " 80 " " 40 " " 80—90 H. P.
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UPKEEP APPROX. $\frac{1}{10}$c. PER BBL.

he Ring-Roll Tube Mill Unit can produce cheaper cement trom every standpoint — upkeep capacity, low power and continuous operation than any other. Ask the users, they can prove it to you, and we can.

SEND FOR CATALOGUE

**STURTEVANT MILL COMPANY - BOSTON, MASS.**

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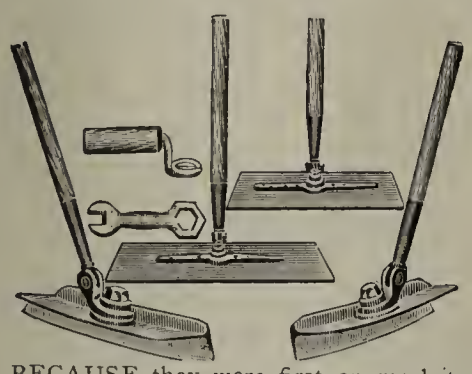

## There Are Reasons Why YOU Should Use ARROWSMITH Tools

BECAUSE they were first on market and have stood the test.
BECAUSE they are adjustable to any angle or height.
BECAUSE you can do your work quicker, easier and better.
BECAUSE one man can do work of five with short handled tools.
BECAUSE they save you time, labor and money.
BECAUSE you can try them 10 days against any others on the market; if you don't like ours better, send them back.

*Write for catalog or set on trial.*

**Arrowsmith Concrete Tool Co.** (Bank Bldg.), **Arrowsmith, Ill.**

## Henry Heil Chemical Company

**210 to 214 South Fourth Street, ST. LOUIS, MO.**

We make a specialty of supplying cement works with

**Chemical Apparatus, Chemicals and Reagents**

Gilmore's Needles, Cement Moulds, Vicat Apparatus, Schumann's, LeChatelier's and Jackson's Specific Gravity Apparatus, Etc.

**Pyrometers, Calorimeters**

**High Grade Goods Only**

*Satisfaction Guaranteed*

# THE ACME TRUCK

## Saves Money All Along the Line

The dependable, powerful Acme solves the problem of haulage. At pit or quarry—at the mill—for maker or for dealer—this sturdy truck hauls for less.

**Extra** strength for heavy service is built into the Acme—without excess weight. The ideal truck for stone and building material haulage.

ACME
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## Proved Units Are a Quality Bond

Acme **proved** units are acknowleged perfections, combined in the Acme to yield better service, at much lower cost per mile.

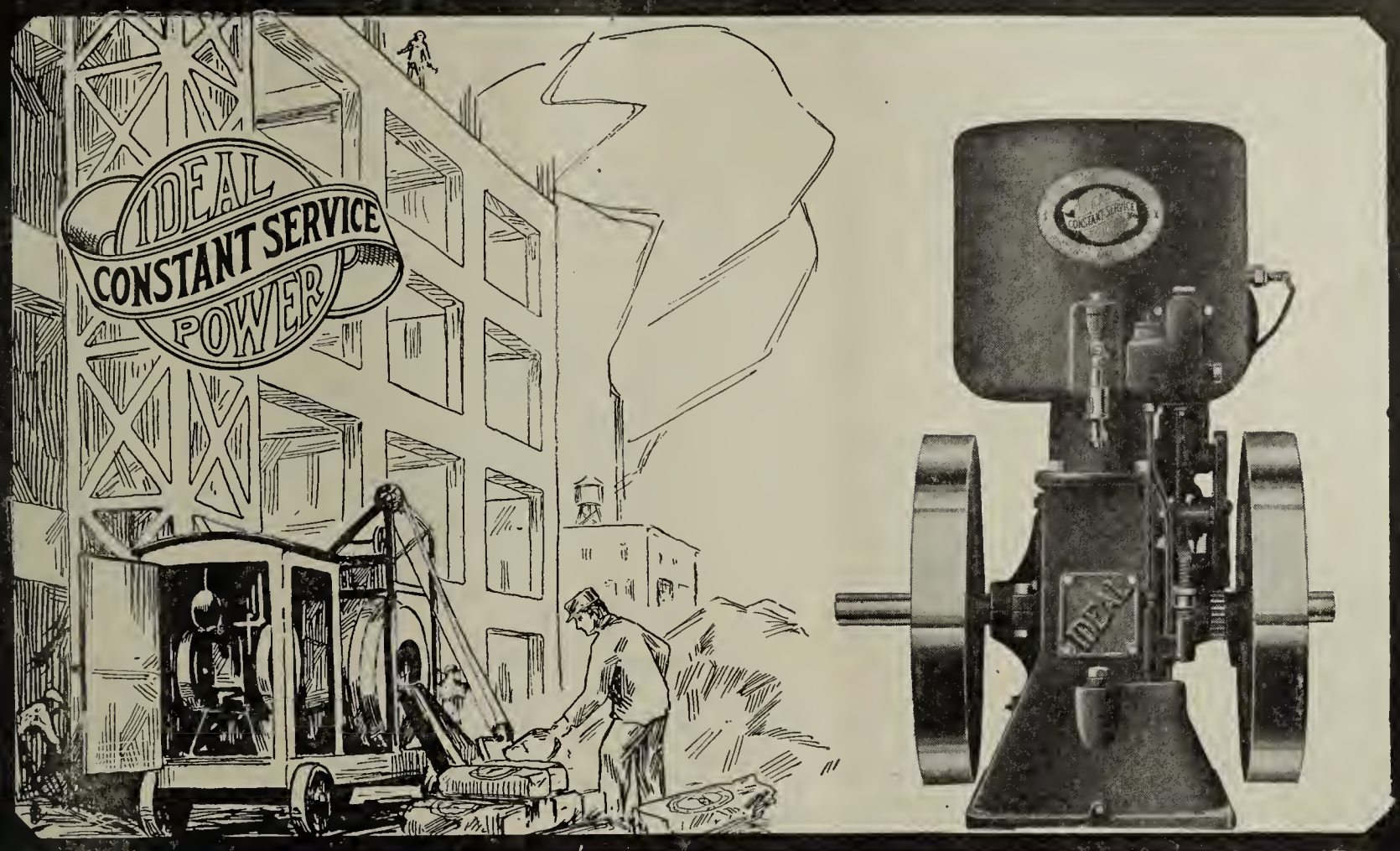
Timken Axles, Timken Bearings, Timken Worm Drive, Continental Motor, Detroit Springs, Cotta Transmission, Pierce Governor, Ross Steering Gear, Long Radiator, Pressed Steel Frame—and so on. Each unit a master contribution to a master truck.

*Write for free book, "A Pointer to Profits"*

## ACME MOTOR TRUCK CO.

**103 Mitchell Street, Cadillac, Michigan**

**One-ton to Four-ton models. Each oversized in both capacity and dimensions.**




# NEVER-FALTERING SERVICE

*Hopper Cooled, Frost Proof, Dirt Proof, Vertical Engines*

Ideal Engines are demonstrating their built-in reliability and fortitude in the day-in and day-out grind of heavy construction work.

They are furnishing power for concrete mixers, power loaders, hoisting and pumping outfits—giving dependable, constant, care-free service. Extreme conditions of weather never hamper their continued performance.

Correct in design—built of right materials with painstaking attention to details, and supported by years of experience in engine construction—Ideal Power is insurance to the contractor against costly engine tie-ups on the rush contract.

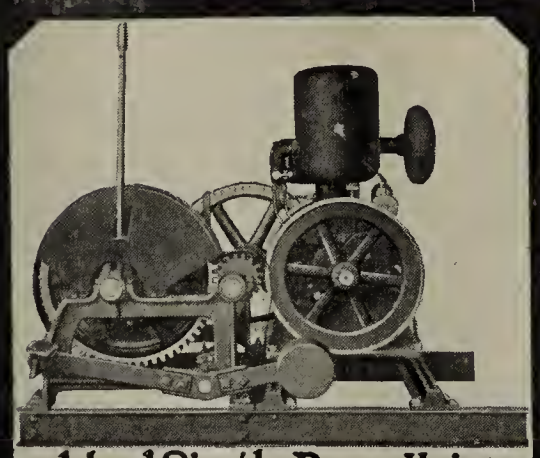
Always on the job—Ideal Engines are found in all lines of construction work in every part of the country.

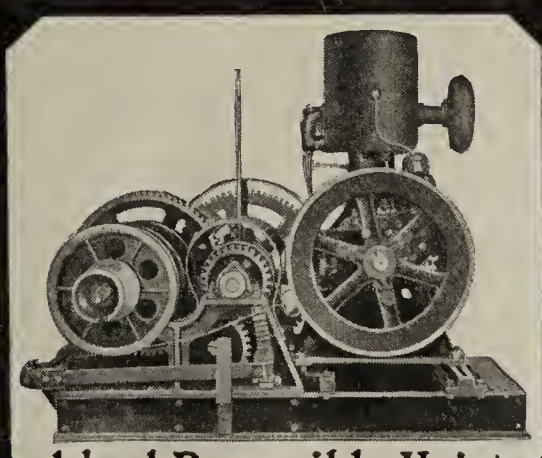
Ideal Power is demanded by the contractor who insists on reliable, dependable economical equipment.

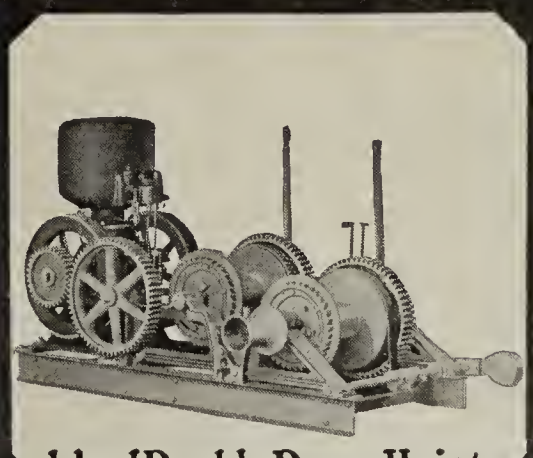
*Ideal contractor equipment includes Reversible Hoists, Single Drum Hoists, Double Drum Hoists, Water and Mud Pumps. Let us send you our catalog containing complete information about Ideal Engines and Outfits*

## IDEAL ENGINE COMPANY

LANSING — R. E. OLDS, Chairman, 804 East Kalamazoo Street — MICHIGAN


Ideal Single Drum Hoist


Ideal Reversible Hoist


Ideal Double Drum Hoist

# "WE ARE GLAD"

to recommend

# SYMONS DISC Crushers

*We have been using these crushers for the past six years along with other kinds. We have several gyratory crushers in different sizes and have used rolls. For the purpose which we are using the discs, we think there is no machine any way near their equal. Signed: F. D. Coppock, Pres. and Mgr., THE GREENVILLE GRAVEL CO., Greenville, Ohio.*

Equip Your Gravel and Crushed Stone Plant with a

# Symons Disc Crusher

It will increase your output, lower your costs and deliver a more uniform material.

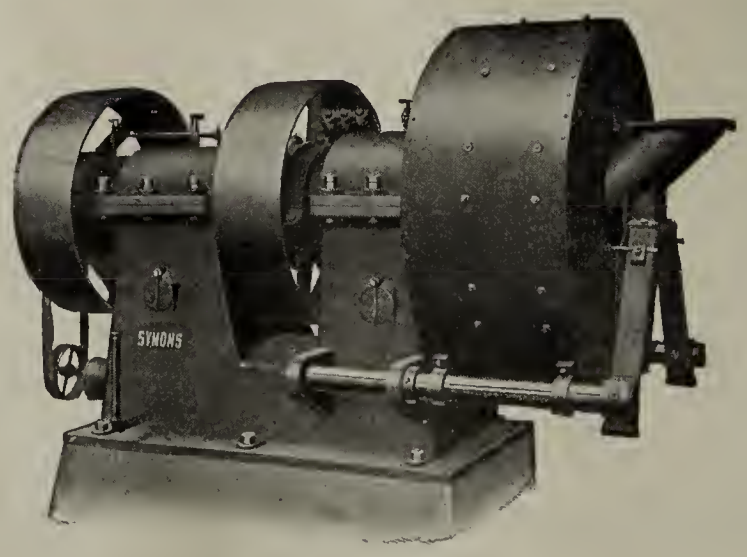
Built in four sizes: 18 in., 24 in., 36 in., and 48 in. Capacities from 5 to 120 tons per hour

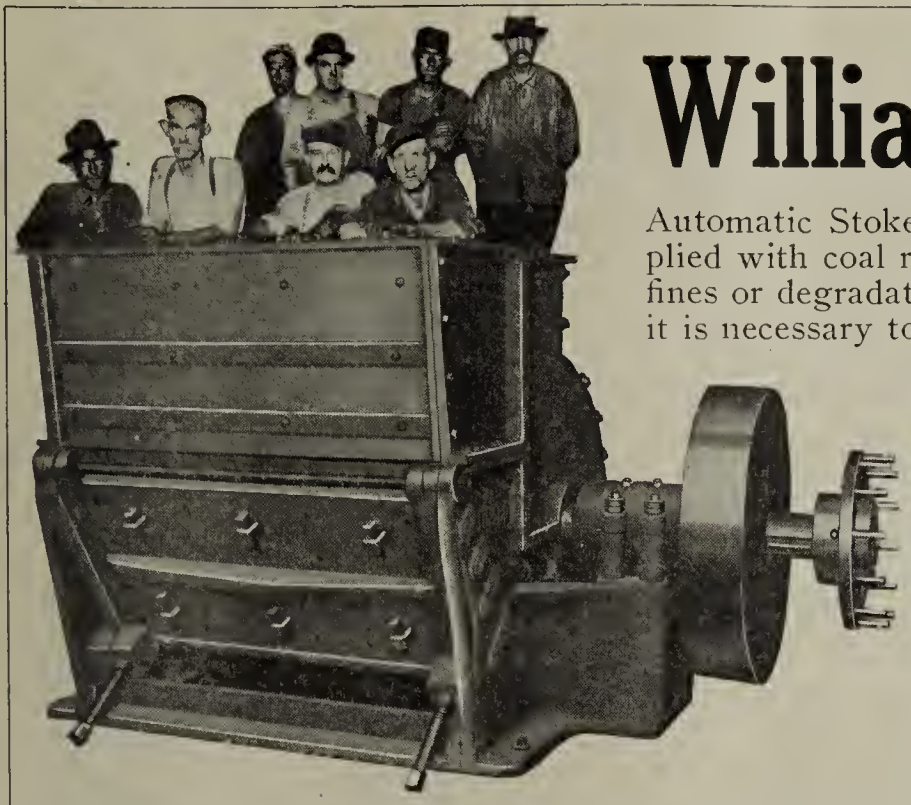
**PROMPT SHIPMENT DURING 1918**

Manufactured and Sold only by

## Chalmers & Williams

Chicago Heights, Ill.





# Williams Coal Crushers

Automatic Stokers and Chain Grates give the best results when supplied with coal ranging from 1½″ down to ¾″, with the minimum of fines or degradation. These sizes, however, are difficult to secure, and it is necessary to purchase instead, run of mine and lump sizes. This again makes it necessary for the consumer of coal to crush those sizes down to such size as will give best results on chain grates and stokers.

For this work the Williams Crushers are unexcelled, hundreds of Williams crushers are doing this work every day, crushing thousands of tons of run of mine and lump coal to stoker sizes. For this work Williams crushers are equipped so that the resulting product will be free from fines or degradation as far as it is possible to control degradation.

Paramount reasons why Williams Crushers should be used for this work are, that Williams Crushers are adaptable to all conditions, they are also adjustable to most every size of crushing; one machine often being used for crushing anywhere from 3″ to ⅜″ at the will of the operator. In addition they are accessible, making renewal of parts or inspection of internal mechanism easy. They are also provided with a Metal trap which gathers in a pocket all stray iron, thus preventing damage to the crusher, a feature not found in any other crusher. Further, Williams Crushers are reliable, as has been demonstrated during the last 22 years, the first Williams Crusher installed being still in active service. Complete information, such as description, specifications, illustrations, etc., will be found in

**BULLETIN No. 17-35**

## THE WILLIAMS PATENT CRUSHER & PULVERIZER COMPANY

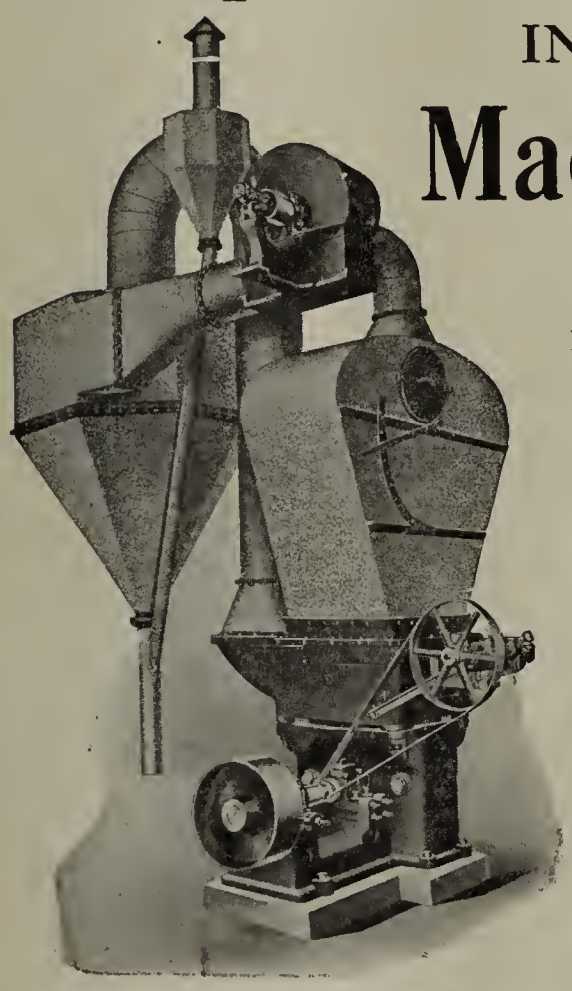
**General Sales Dept.—37 West Van Buren Street**
**CHICAGO**

**Plant**
**ST. LOUIS**

**67 Second St.**
**SAN FRANCISCO**



## Complete Grinding IN ONE Machine



In successful use grinding
Cement, Clinker,
Limestone, Coal

INSTANT
REGULATION
OF
FINENESS

NO DUST

*Send for Circular*

## THE BONNOT CO.
CANTON, OHIO



## Experienced Construction Men

Realize the importance of efficient conveyor belts. Therefore they always specify

TRADE **SAWYER** MARK
Registered

## Stitched Canvas Belting

*A record of thirty years of satisfaction in the cement field.*

**United States Rubber Co.**
**Mechanical Goods Division**
**NEW YORK**

# At your service

"AT your service" might be considered the ATLAS slogan. It expresses the spirit which permeates every department, yes every man, in our nation-wide organization.

We have the benefit of more than a century's experience in making explosives. Through our service department, which is the mouth-piece for expressing the co-operation of our entire organization, all of this century's experience is at the disposal of *any man* who has blasting to do.

We are confident that if you will but utilize this personal ATLAS service—

*First:* Your blasting will be done better.

*Second:* Your blasting will be done more economically.

*Third:* You will be glad you put your blasting problems up to us.

## ATLAS POWDER COMPANY

Home Office, Wilmington, Del.

**SALES OFFICES: Allentown (Pa.), Birmingham (Ala.), Boston, Chicago, Des Moines, Houghton (Mich.), Joplin (Mo.), Kansas City, Knoxville, McAlester (Okla.), Nashville, New Orleans, New York, Philadelphia, Pittsburg (Kan.), Pittsburgh (Pa.), Pottsville (Pa.), St. Louis, Wilkes-Barre (Pa.)**

**PUT YOUR BLASTING PROBLEMS UP TO US**

Our Service Department is a clearing house of blasting experience in all its phases and under all conditions. It is directed by experts who will personally help you supply this vast store of information to *your own blasting.* WRITE TODAY.

**A PROPER EXPLOSIVE FOR EVERY BLASTING REQUIREMENT**

# Why Pay High Prices?

HIGH SPEED BOSS CONTRACTORS' EQUIPMENT

## SAVE LABOR

WITH OUR

**BUILT OF STEEL - HIGH SPEED**
**HYATT ROLLER BEARING**

## Contractors' Equipment

**Get our prices and terms before buying your paver**

**1918 Model**

## Lincoln Highway Type

One man traction paver is fastest
--lightest paver built

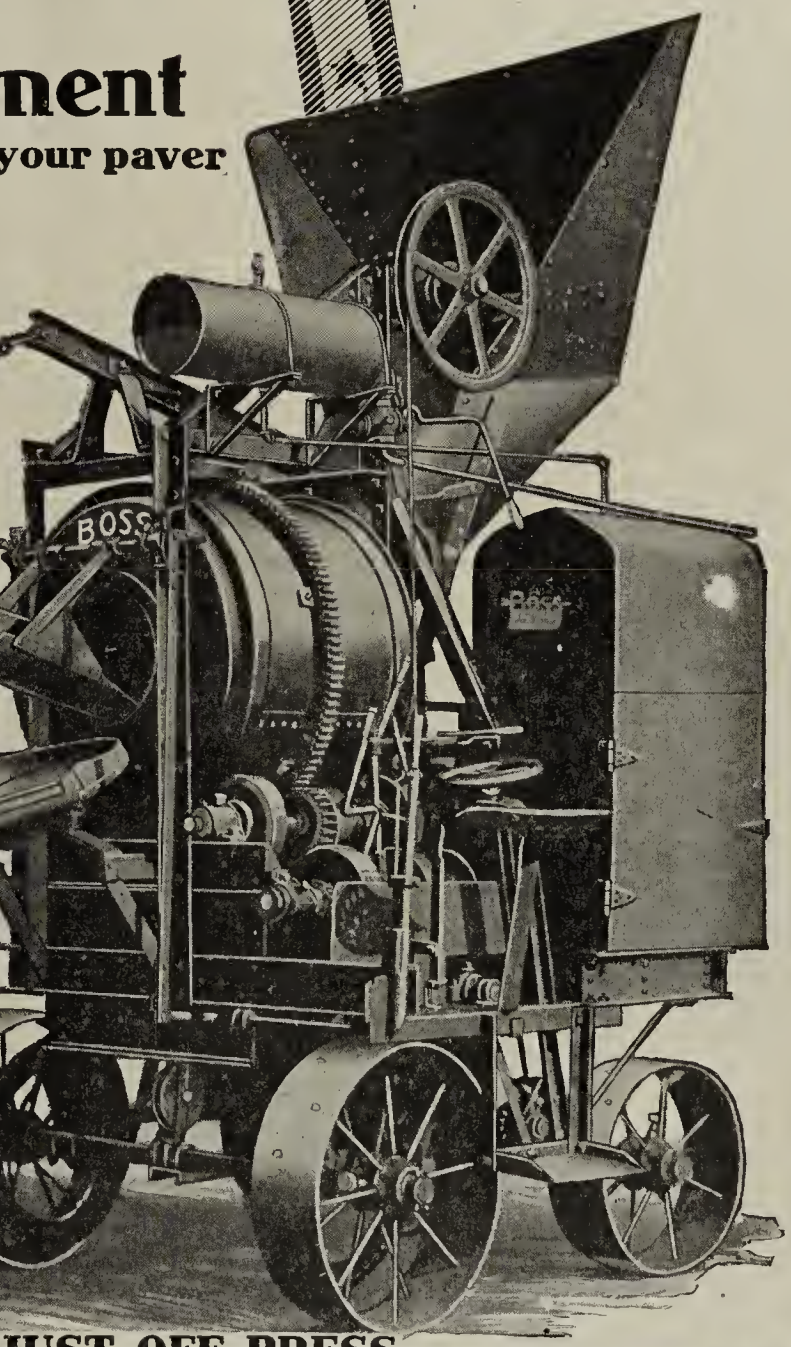
14 ft. capacity
Weighs one ton less
Built-in hoist for operating leveling board
Automatic power charger
Measuring water tank
Two-way traction
Gas, kerosene and steam

Hundreds in use

**The American Cement Machine Co., Inc.**

**KEOKUK, IOWA, U. S. A.**

**Two Bag Size**
**High Drum**
**non-tip type**
**PAVER**

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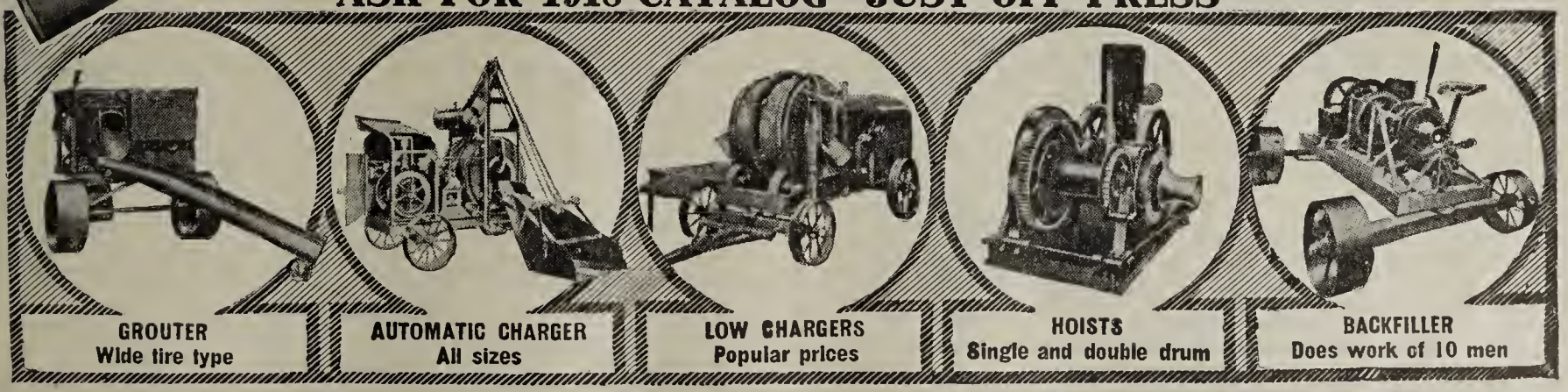
**ASK FOR 1918 CATALOG—JUST OFF PRESS**



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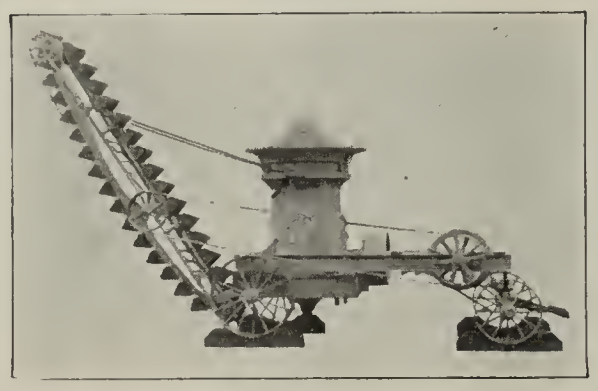
Wide tire type

AUTOMATIC CHARGER
All sizes

LOW CHARGERS
Popular prices

HOISTS
Single and double drum

BACKFILLER
Does work of 10 men



Austin Portable Gyratory Crushers
—50 Tons per Day

# TURN YOUR ROCKS INTO REAL MONEY

Rock-Crushing is a matter of dollars and cents. For every requirement there is an Austin Gyratory Crusher so nicely proportioned, so strongly built to withstand maximum strains, so adjustable to varying needs, that there is only one thing to consider—crushing rock You may rely upon that — repair bills and delays do not figure when Austin is on the job.

Built in nine sizes, from 50 to 5000 tons per day. In stationary and portable types.

Plans and specifications submitted and expert advice free on any problems involving rock crushing or earth handling.

Catalog No. 27 tells in detail why the Austin Gyratory Crusher is the choice of big and little contractors generally. There are many exclusive features you ought to know all about.

## Austin Manufacturing Company
CHICAGO, ILL.

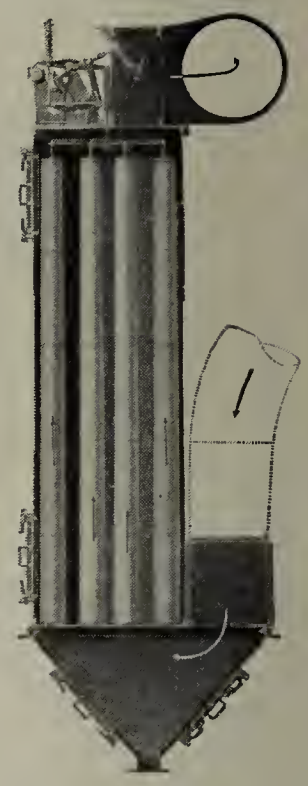
# The Allis-Chalmers Dust Collector

**DUST** *Increases the wear and tear on machinery*

**DUST** *Reduces the efficiency of your plant.*

**DUST** *Is the origin of disease.*

**DUST** *Is the cause of labor difficulties*



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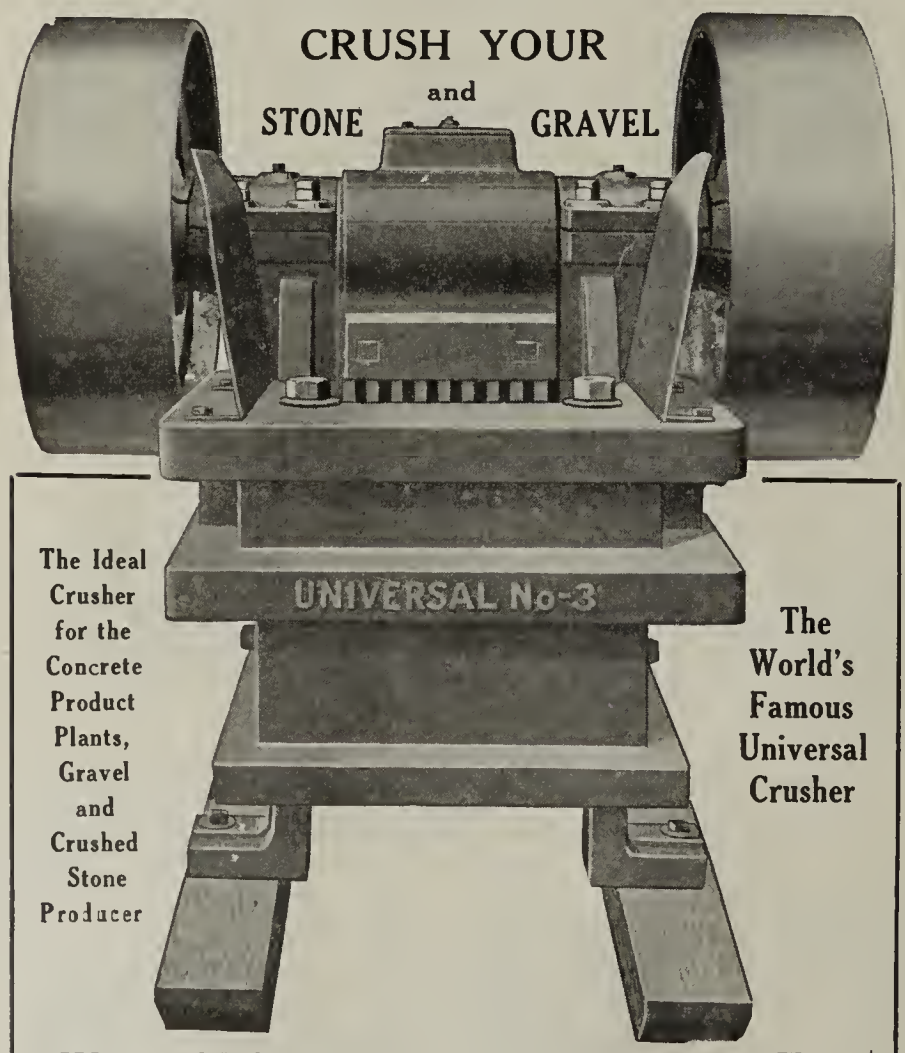
## ALLIS-CHALMERS MFG. CO.
MILWAUKEE, WISCONSIN

*Offices in all Principal Cities*

CRUSH YOUR STONE and GRAVEL



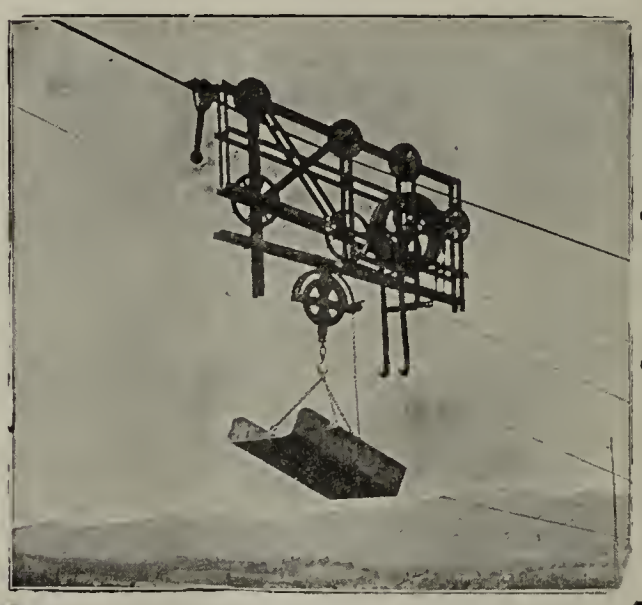

The Ideal Crusher for the Concrete Product Plants, Gravel and Crushed Stone Producer

The World's Famous Universal Crusher

***We Build Crushers from 5 Tons to 300 Tons per 10-hour Capacity***

Instantly adjusted to produce size required from ¼ inch to 3 inches. *Write for Folder No. 14.*

## UNIVERSAL CRUSHER COMPANY
230 Bee Ave Cedar Rapids, Iowa, U. S. A.



# The Rugged Ruggles

## AERIAL CARRIER

Suspended over Slate Quarry

## SELF DUMP BRAK LOCK ING

**Built in Two Sizes:—1 to 5 tons capacity, 5 to 10 tons capacity.**

The **Rugged Ruggles** is made for special use on cement and gravel construction work. For all kinds of quarries where the waste is taken from the pit and dumped at the surface It will take any load up to **ten** tons, from any depth to the cable, where it is automatically released and sent either up or down the cable and dumped in mid-air or lowered. One man can operate three **Rugged Ruggles** on as many cables with a three-drum engine:

**No brake to wear the cable—Can run on a flat cable.**

Simple in construction; made entirely of steel; all the sheaves steel bushed or brass, and is backed by years of extensive use.

**Manufactured by**

## Ruggles Machine Co., POULTNEY VERMONT Dept. C

DU PONT AMERICAN INDUSTRIES

# Fire Charges With Electricity

## To Increase the Efficiency of Explosives Reduce the Liability of Accidents and Save Time and Labor.

The use of Blasting Machines enables several shots to be fired simultaneously,—this united action increases the efficiency of explosives.

The location of Blasting Machines in places of safety reduces the liability of accidents.

Several shots can be fired at one performance,—saving the labor and time necessary to detonate single charges.

Ask for Blasting Supplies Catalog. Use the coupon to learn about other DU PONT PRODUCTS.

## E. I. du Pont de Nemours & Co.

**Powder Makers Since 1802** **Wilmington, Del.**

**Note:** When in Atlantic City, visit Du Pont Products Store, Boardwalk and Penna Ave.

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Du Pont Chemical Works, New York, Pyroxylin and Coal Tar Chemicals.
Du Pont Fabrikoid Co., Wilmington, Del., Leather Substitutes.
The Arlington Works, 725 Broadway, New York, Ivory Py-ra-lin and Cleanable Collars.
Harrison Works, Phila., Pa., Paints, Pigments, Acids, Chemicals.
Du Pont Dye Works, Wilmington, Del., Dyes and Dye Bases.

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Adv. Div. (E. I. 112), Wilmington, Del.

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| ☐ Sanitary Wall Finish | ☐ Ethers |
| ☐ Antoxide Iron Paint | ☐ Proxylin Solvents |
| ☐ Bridgeport Wood Finish | ☐ Soluble Cotton |
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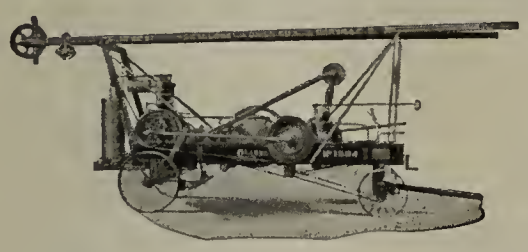
DU PONT

# A Big Blast-Hole Drill That's Reliable



## The Cyclone No. 14

Heavy, solidly braced frame — Sill timbers 4" x 14". All machinery placed directly on the main sills protecting it against strains and preventing top heaviness. **Eighty per cent (80%) of the castings are cast steel**—not cast iron. The Cyclone No. 14 is the only Blast-Hole drill so built. Furnished in Steam, Gasoline, Compressed Air or Electric Power; traction or non-traction.

**The Sanderson Cyclone Drill Co., Orrville, Ohio**

**Eastern and Export Office, 50 Church St., New York, N. Y.**

# BRUNER'S PATENT DUSTLESS FLOOR FINISH

See APRIL ISSUE
Cement and Engineering News
Page 17

*Responsible Licensees wanted in every city*

**P. M. BRUNER**

618 Frisco Bldg. St. Louis, Mo.

BECAUSE WE SPECIALIZE ON

**Lock Seam Pipe** with the smooth inside surface, having already furnished large quantities for Potash Recovery plants, we are able to give especially careful attention to the construction of this class of Pipe.

**Robertson Bros. Mfg. Co., Chicago**

# MOLDS MOLDS MOLDS

## Complete Outfit for "Ornamental Concrete"

Consisting of

**Iron and reinforced Composition Molds and Patterns as: Columns, Balusters, Balls and Bases, Pier Blocks, Roofing Finials, Pedestals, Sundials, Benches, Flower Vases, Flower Boxes, Jardinieres, Monuments, Tombstones, Friezes, etc.**

**BARGAIN** if taken immediately, on account of old age and sickness. May divide.

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# SOPER ENGINEERING CO.

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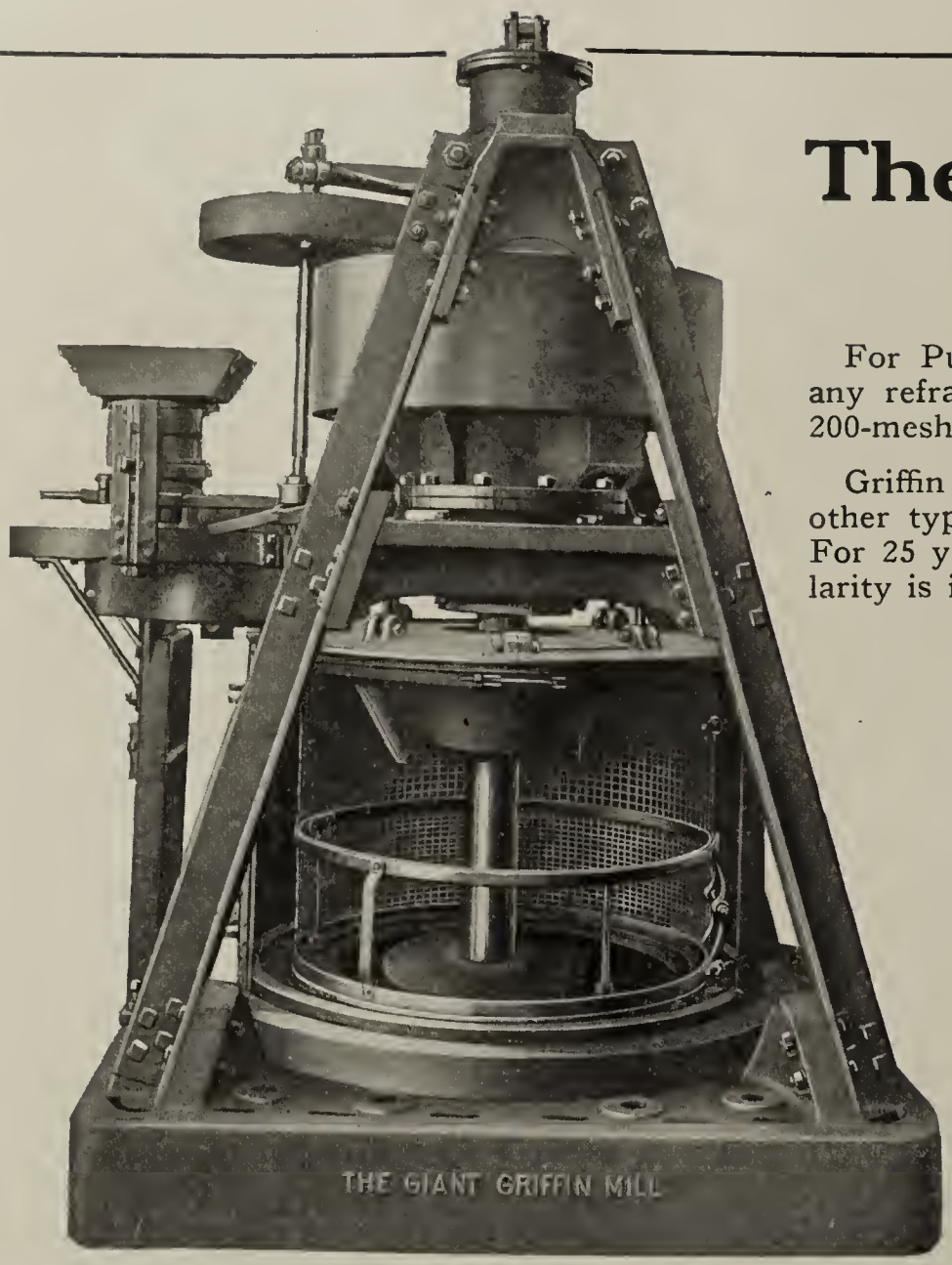
Designing, Constructing and Operating Engineers and Contractors

Cement Plants and Reinforced Concrete Bridges a Specialty




# The Improved Giant Griffin Mill

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Griffin Mills are used by Cement Plants more than any other type of pulverizer. Now in operation in 45 plants. For 25 years they have led the procession and their popularity is increasing.

Recent improvements have reduced their former low H. P. and Maintenance Cost to the Minimum. Why not investigate this new Griffin Mill?

Recommended for Agricultural Limestone Producers as well as Cement Producers.

GRINDS ANY DRIED REFRACTORY MATERIAL.

Our Engineers Are at Your Disposal.

## Bradley Pulverizer Co.

**Works Allentown, Pa.**

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Crushing Plant of the Oklahoma Portland Cement Co., Ada, Oklahoma.

When this Company installed the Traylor 36x72 in. Type C Jaw Crusher, they eliminated unnecessary waste of POWER, LABOR and COSTLY SHUTDOWNS for reasons fully described in Bulletin J1—GET IT.

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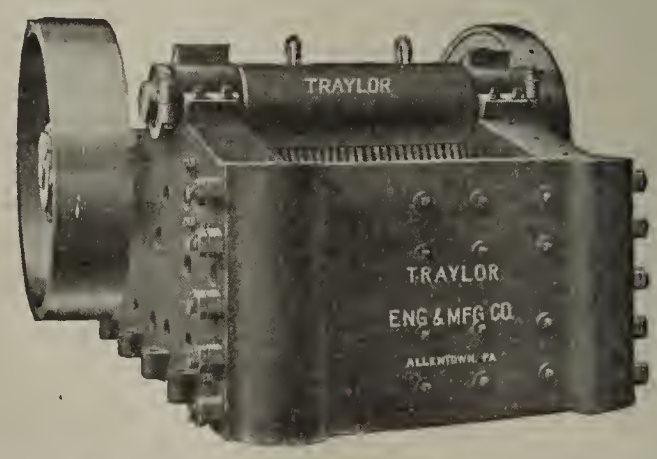
# "IT'S A BEAR"

FOR CRUSHING HUGE PIECES OF STONE WITH EASE AND MINIMUM POWER CONSUMPTION

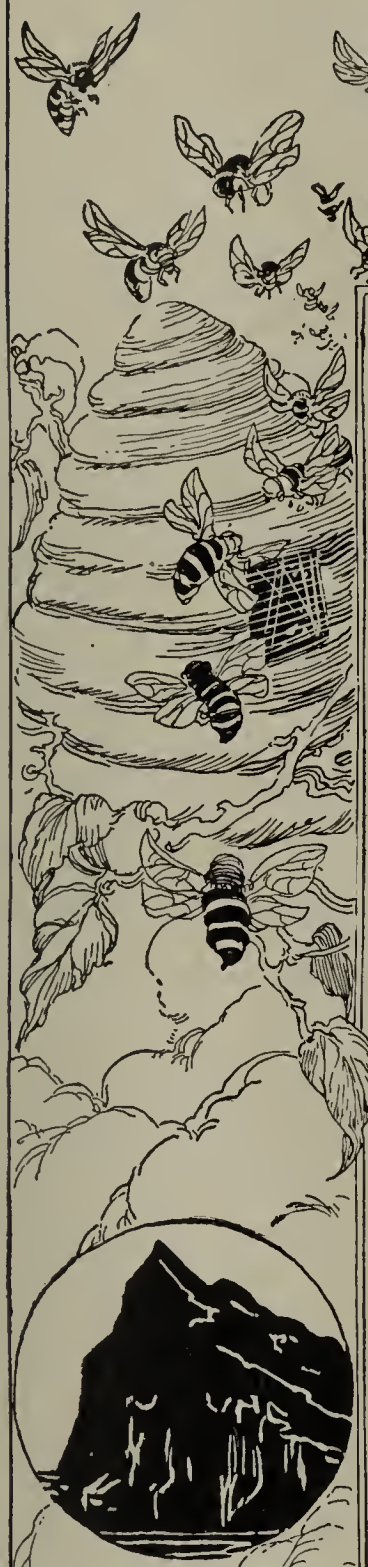
THAT'S THE

# TRAYLOR "TYPE C" Jaw Crusher



# Co-operation

## by Leigh Mitchell Hodges



*What you see in a comb of honey is a pound of perfect sweetness encased in a wax structure that is a triumph of architectural engineering.*

*You pay twenty-five or thirty cents for this, take it home, spread it on your bread to tickle your palate and help fill your physical fuel bin, and—*

*What you don't see in this comb of honey is a little army of bees working harder than Trojans ever worked, sucking the ambrosia from clover blossoms.*

*Your pound of honey contains 7,000 grains of sugar. Each clover blossom provides about one-eighth of a grain, so this pound represents the sweet fruitage of 56,000 clover heads.*

*But the clover head is composed of about sixty florets or flower tubes. To extract the hidden sweet the bee must probe each of these. This means some sixty separate operations on each flower.*

*If one bee contracted to gather a pound of honey, that bee would have to explore 3,360,000 of these tiny tubes to secure the material. Allowing five seconds for each exploration and twelve hours to a day, it would take this bee some four hundred days to produce a pound.*

*And this would represent only the gathering of the honey, not the time required for building the wax-case and storing the sweet stuff.*

*Bu there never yet was a hive with just one bee to each comb.*

*Nature commands pooled effort.*

*Hundreds of bees to each comb make a comparatively quick and easy operation of what would be an impossible task for one bee working alone.*

*So what we do not see in the comb of honey is the greatest of lessons in the greatest of success-makers—Co-operation.*

*On every side Nature flaunts this lesson in man's face.*

*The seed itself is nothing.*

*Sun, soil and moisture must co-operate with the latent germ in order to produce plant life.*

*The solidest rock is only co-operating atoms.*

*The strongest man is weak alone. Only by working with others or winning others to work with him can he achieve worth-while results.*

*The million men now training to fight under our flag in France couldn't gain a foot of Teuton territory if they went to war one by one.*

*Co-operating, they can turn the tide in favor of freedom.*

*The biggest business is bound for failure if its workers do not co-operate.*

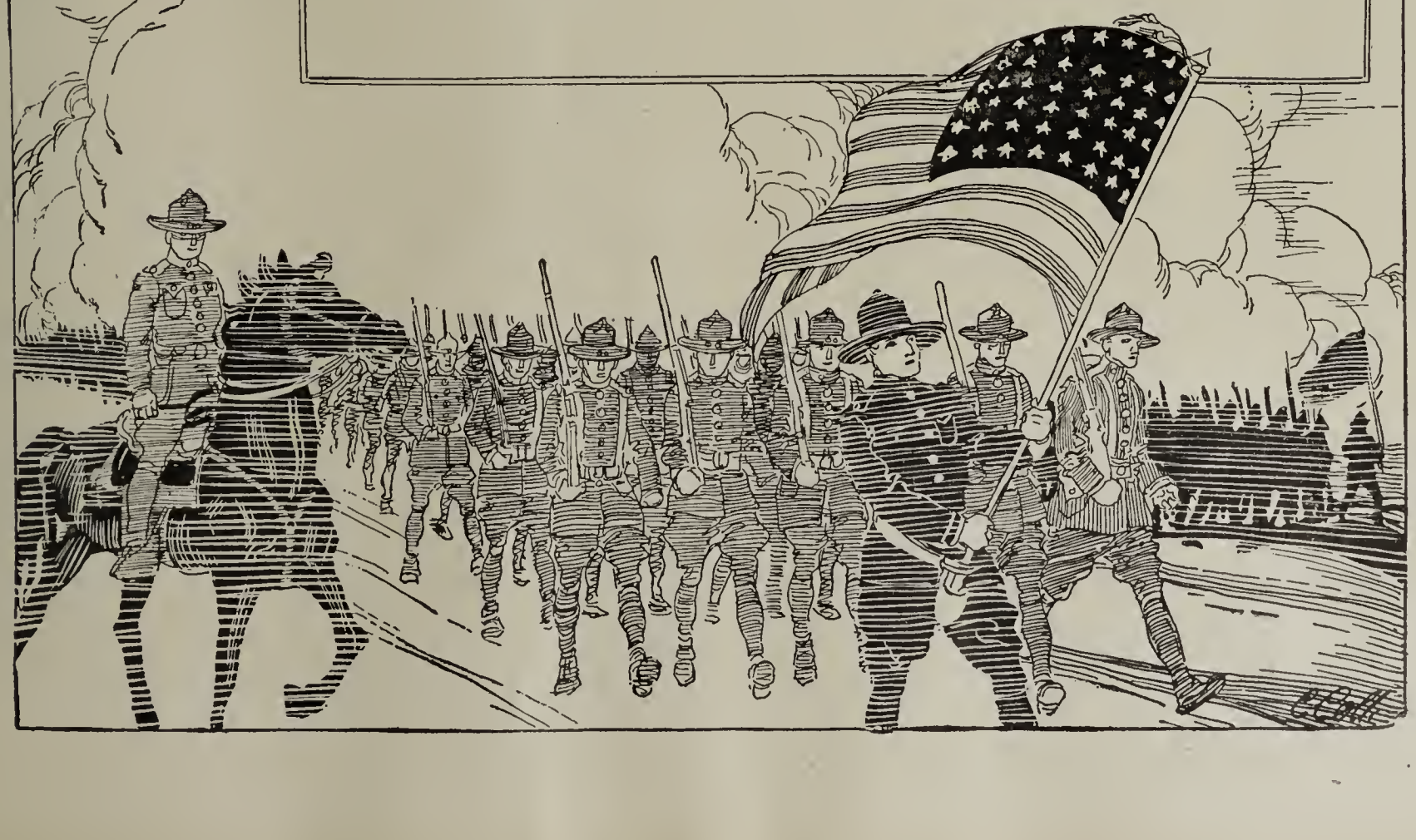
*It is a machine whose parts do not work together. It may run for a while on its own momentum, but it is headed for the dump-heap.*

*To co-operate is to join forces and something more. It is to join hearts as well as hands, and slip a little soul in the bargain.*

*Not to co-operate is to court loneliness, life-rust and loss.*

*The a. B. c. of success is this—Be a Bee!*

*CO-OPERATE!*



# CEMENT AND ENGINEERING NEWS

(PUBLISHED MONTHLY)

**WILLIAM SEAFERT, Editor and Publisher**

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Advertising copy or changes in ads. must be in this office by the 25th of each month, as hereafter our magazine will appear on the 5th of the following month

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JOHN F. WALDRON - - - - - - - - Advertising Manager

CHICAGO, APRIL, 1918


## Reinforced Concrete in Sea Water Construction

The startling revelation that reinforced concrete construction, as practiced nowadays, cannot be applied with safety to sea water construction comes as a timely warning now that we are adding a new chapter to the many uses of concrete construction, namely that of shipbuilding.

Mass concrete has been used for about a century; but the application of reinforced concrete to sea water construction is of comparatively recent date. This explains why conclusive data covering the behavior of sea water concrete are available only since a short time.

During the past six months (in a number of articles published in Engineering News-Record), Wig and Ferguson have brought to light facts about reinforced concrete in sea water that have to be considered the more valuable as they were obtained through a two-year inspection of all concrete structures of importance in the waters surrounding the United States and as the authors represent the United States Bureau of Standards and the Portland Cement Association.

The conclusions arrived at are that reinforced concrete will, in practically any climate, begin in a short time to fail above sea water, and that steel embedded to a depth of only one or two inches is not properly protected against corrosion.

The cause of this corrosion the investigators consider to be the accumulation of salts in the pores of the concrete above the water line by capillarity and evaporation. When the metal is near the surface it will corrode much more rapidly than when embedded to a greater depth, but the thickness of covering must be much more than has been commonly supposed.

A study of mass concrete in sea water has invariably brought out the fact that for marine construction especially rich mortar mixtures are required and that density and imperviousness are the principal requirements for concrete submerged in sea water. Only dense rich concrete can resist the chemical disintegration which is peculiar to sea water exposure.

Concrete construction, if applied to sea water, will have to undergo a number of changes, first of which must necessarily be a more thorough protection of the steel, by embedding it deeper in the concrete, and the application of very much richer concrete and mortars than we are accustomed to from concrete construction on land.

## The First Concrete Ship

The first concrete ship has made a round trip and sailed into its home port in fine shape. It is called the Nansenfjord, and is a Norwegian vessel, and has just returned from the British Isles after having steamed 2,000 miles.

The vessel was built several weeks ago. It is made of structural steel and concrete, after the fashion of building bridges. It has answered every test, the vibration of the engines affecting it not the least; its sides withstanding the jamming which a ship frequently receives when it is docked; its hull cutting the water clean, and the effect of contraction and expansion showing not the least damage to the vessel. It is a single screw vessel, driven by a heavy oil engine, and has a displacement of about 500 tons.

The builders do not claim that the concrete ship is going to revolutionize shipbuilding. That is to say, they do not claim that wooden vessels and ships of steel will go out of fashion. But they have shown that concrete ships are practicable, that they are comparatively inexpensive, and that their construction will relieve the demand for ship timber to some extent. The saving in steel will also be considerable, as the amount of the metal used in the concrete vessel is not great.

## Contracts Awarded for Concrete Ships

The last of the four first concrete ship contracts for the United States Shipping Board, it was learned last night, has been awarded to the Ferro Concrete Construction Company, of Redendo Beach, Cal. It will be of 3,500 tons, deadweight, and the estimated cost of the hull is $160,000.

Unlike the contractors for the other three concrete ships the Redendo Beach firm assumes the entire financial obligations. In the other three contracts, the Shipping Board assumes liability for half the costs in the event that the more or less experimental construction should prove impracticable. This liability amounts to $44,000.

If one or more of these first four contracts should result in evolving a successful concrete hull type, the successful contractor will have the opportunity to build four or five more for the board.

The other contracts are held by the following: The Liberty Shipbuilding Company, of Boston, 3,000 tons, deadweight; the Fougner American Steel Concrete Shipbuilding Company, of New York City, 3,500 tons, deadweight, the San Francisco Shipbuilding Company, of San Francisco, 7,500 tons, deadweight. The West Coast Shipbuilding Company has begun work at Everett, Wash., on the construction of a new plant where they expect to manufacture concrete ships, each to be 436 feet long and of 6,000 tons' capcity. The ships are double bottomed, with 10 per cent steel reinforcement, and with two decks.

# *Top Finish of Concrete Floors*

## Getting the Water Out of Second Course to Make Quick Troweling Possible and Get Better Concrete.

By P. M. Bruner*

Reinforced concrete has so many elements of merit that it is constantly making inroads on other systems of constructing office, institutional and industrial buildings. Naturally a concrete floor finish on top of the reinforced construction suggested itself long ago. The most practical way of placing this kind of finish and the most reliable composition and thickness of it have been slowly evolving by practical experience.

There are two courses to follow in placing this kind of finish, namely:

The finish, ½″ to 1″ thick, may be applied as fast as the liquid concrete is poured, or the finish may be laid on the hardened reinforced concrete after the building is closed in, the plastering finished and the plumbing and heating apparatus installed.

The advantages of laying the finish immediately after the concrete is poured are as follows: (1) the chipping and cleaning of the hardened concrete may be omitted at a saving of ¾ ct. to 1½ cts. per sq, ft.; (2) the hardening of the finish will proceed in this case along with that of the freshly poured concrete. There is no other advantage.

The disadvantages of placing a concrete finish at once are several: (1) The concrete will always be poured in daylight and the finish cannot be placed on this for several hours or until the concrete can be walked on and worked on. The finish must therefore be laid in the latter part of the day and late at night. (2) The reinforced concrete must be struck off to correct grade on properly placed gauges and even then the concrete will settled unevenly and form low places after removal of false work. (3) Where the finish, ½″ to 1″ thick, follows tool long after the concrete was poured, laitance will have formed in places and this in dangerous amounts cannot be discerned, thus endangering the permanent adhesion of the finish. (4) In freezing or rainy weather it may be possible to place at the same time the finish and protect it. (5) The newly placed finish must be at once covered with sand or other efficient covering to withstand the wear and tear of succeeding heavy building operations. (6) Many parts occupied by scaffolding supports and apparatus, etc., must be patched in afterwards. Of these disadvantages the cost of covering and protecting the floors until completion for many weeks, and the difficulty of providing tolerably level floors, are the most serious. The extra risks from unfavorable weather and providing special protection more than equal the cost of cleaning the hardened but closed-in floors.

It it possible to put a fair finish on freshly poured reinforced floor without adding any new material by floating the concrete while still liquid, bringing to the top the finer parts and depressing the coarser. In this case it is helpful to sprinkle a little dry finishing cement composition over the concrete and float this in; this will help to make a better gloss, but can do little more. The amount that can be worked in without humping is small and uncertain, at best, ranging unevenly from ⅛″ to ½″ in thickness. When this skin wears off at thin spots, the floor will begin to show patches of coarse gravel or stone, exposed on the surface. The other method has all the disadvantages of the method previously described, except that the finish material, amounting to very little in quantity, will save this contractor 1 ct. to 3 cts. per sq. ft., below the cost of the former method.

The most practical way and best time to place the finish is to lay ½″ to 1″ of first-class topping after all the heavy work is completed. This is at a time when a first-class permanent wood floor is generally laid. The reinforced concrete floor may be then thoroughly examined and cleaned from laitance, soft concrete and dirt and on this prepared surface the finish can be laid on grade after the floor has first been soaked with water and flushed with liquid cement.

The advantages of this method of laying the topping near the end of the building operations are: (1) The reinforced concrete can be tested and bad concrete can be cut out. (2) The floor level is permanent and grades can be depended on to remain as found. (3) Shrinkage cracks that have developed in the base can be detected and sometimes remedied. (4) The work can be done independent of the weather and will escape the wear and tear of the heavy and rough building operations while the finish is still soft and easily injured. (5) The work can go on uninterruptedly from first floor upward or from top floor downward. (6) There will be no inserted patches that could not be reached at an earlier part of the building operations. The disadvantages are the cost of cleaning the hardened concrete, and the greater excellence demanded at the later periods of construction.

The driest concrete mortar that can possibly be spread and rodded to level or grade contains 20 per cent more water than what is required to make first quality top-coat. This excess of water has a worse effect on the top-coat than a similar volume of fine sand would have. Such a mortar can not receive the necessary finishing operations for many hours after it is spread. Only a slow drying process and incipient chemical action will eventually stiffen the top-coat sufficiently for the final smoothing operations.

We have discovered and patented a method of removing, in a very short time, the excess of water from the top-coat after it has been spread and struck off to desired level or grade.

[*Editor's Note*—This is described in an Am. Concrete Inst. paper by Mr. Bruner, from which the following is quoted]:

"I lay on the plastic floor surface, when brought to its proper level, a webbing of some kind, and place over this some dry material which quickly withdraws the excess of water by the capillary attraction of the dry materials. This may take up 20 per cent to 30 per cent of the water originally used in producing plasticity of the mortar. It will not take up more than this, and the amount of water left in the mass corresponds quite well with the amount that a professional cement tester considers necessary in making proper test pieces.

"What I claim for this process is: First, a harder and a denser top coat; second, a wearing coat that is equal to the best work on sidewalks, and third, the elimination of overtime work by an extra expenditure for labor of

---

P. M. Bruner Granitoid Co., St. Louis.

only 1-10 ct. to 1-5 ct. per sq. ft. in laying a floor, and this extra expense is more than offset by the usual cost of overtime work."

The topping is then compressed and floated and troweled by hand to a finished surface. All this work is completed a long time before the crystallization process or the setting of the topping begins. Best of all, the topping is reduced to such a consistency, by the drying process, that it can be walked on and worked on without the use of stilts or bridges of any kind. The labor on it is uninterruptedly progressive and is cheapened quite materially, because there is no secondary filling under guide strips and because there is no long continued waiting by workmen on a time and half basis. The cost of the drying or desiccating process is overbalanced by the continuity and celerity of the process.

This drying process is as applicable when the finish is laid on newly poured concrete as it is when the reinforced concrete has hardened and dried out.

Responsible licensees wanted in every city. Address P. M. Bruner, 618 Frisco Bldg., St. Louis, Mo.

were given by men who are manufacturing pipe and tile. It was a manufacturers' meeting and the hearty response of those who were asked to give papers was a matter of a great deal of satisfaction. Edmund T. Perkins, one of the most prominent drainage engineers in this country, also told us some interesting things about the relation between the title manufacturer and winning the war, in addition to giving the paper assigned.

Complete stenographic notes of all papers and discussions were kept and as soon as the notes are transcribed and edited, the Proceedings will be mailed to members.

On the whole the convention was worth a great deal to the one hundred who attended and our officers and committees are to be congratulated on the large attendance and interest shown.

New Officers elected for the following year: President, J. L. Zeidler, St. Joseph, Mo.; vice president, W. E. Goodman, Saginaw, Mich.; secretary-treasurer, J. H. Libberton, Chicago; executive committee, George Scofield, Tacoma, Wash.; E. H. Beckmeyer, Sioux City, Iowa; Howard Mills, Rensselaer, Ind; W. F. Gillett, Marshall, Minn.; P. H. Atwood, Armstrong, Iowa.

House of Concrete Blocks. Blocks Laid Up and All Mason Work Done by Eighteen-Year-Old Boy. First Job Done by Him and Pronounced Very Good for a Boy. Location, Hoopston, Ill.

## Convention of American Concrete Pipe Association

Efficiency and economy were the salient features of the business sessions of the annual convention of the American Concrete Pipe Association, and food and fun afforded the customary relaxation, writes J. H. Libberton, secretary, 210 South La Salle street, Chicago.

Every subject under discussion was of exceptional interest and well handled. Willis F. Gillett outlined the real saving effected by the use of bulk cement in a clear, concise manner. A clear analysis of cost-keeping methods was given by Frank J. Lawson. From the technical standpoint the talks by R. W. Crum on "Proportioning Mixtures," and G. W. Porter on "Tile Testing" were of exceptional value. A general survey of the possibilities of the south as a field for drain tile manufacture was given by Edmund T. Perkins and another interesting paper on "Sewer Pipe on the Pacific Coast" was sent in by L. Y. Stayton. Mr. Stayton was unable to be with us so his paper was read by W. A. Curless. Coleman Meriwether imparted some valuable helps in his talk on "Pipe Promotion."

The feature of the convention was the fact that these talks on the fundamentals in the pipe and tile business

## Materials Men Organize

### National Crushed Stone and the National Slag Associations Advocate Building Macadam Roads

The National Crushed Stone Association and the National Slag Association were organized in Columbus, Ohio, January 16, following the close of the annual convention of the Ohio Macadam Association, held at the Chittenden Hotel. These two new bodies, as their names indicate, national in scope, are composed of road material men, who are advocating the construction of macadam roads as a means of solving the transportation difficulties of the country.

Representatives of the stone industry in ten states of the central west took part in the organization of the National Crushed Stone Association. A. J. Blair, Milwaukee, was chosen president, and F. W. Connell, Indianapolis, secretary. A. P. Sandles was chosen to represent the association at the meeting of the Highway Industries' Association at Chicago, January 21.

The National Slag Association elected these officers: F. A. Sarstedt, Cleveland, president; F. E. Miller and H. J. Love, Youngstown, vice-president and secretary, respectively; W. D. Brewer, Pittsburgh, treasurer.

# *Concrete Silos Are Money Makers*

Two important facts loom up big in the outlook for the concrete silo construction business: the banks of the United States are full of money that belongs to farmers, and the farmers are getting used to war headlines in the daily papers. Taken together, these two facts mean that the American farmer is going to have money to invest this coming summer.

The day of experimentation in silo construction is past. Every agricultural college in the country is now boosting the concrete silo as the very best and the most economical that can be built. Farmers are getting accustomed to look upon the concrete silos as the kind that they ought to have. They are beginning to consider something besides first cost.

Farmers are granting now that the profits from their farms are dependent on the methods and amount of their stock raising. This connection, then, between live stock and bank balances being assumed, the farmers clamor for a successful method of feed storage.

The concrete silo has solved this feed storage problem economically and securely.

Such expressions as "I could do without my binder as easily as I could do without my silo," from an Ohio farmer, or "I can feed more stock with my silo on six acres than I could on twenty-five acres without it," from an Illinois farmer, or "Words cannot express what our concrete silos mean to us," from a Kansas farmer—all indicate the enormous momentum the concrete silo business has attained.

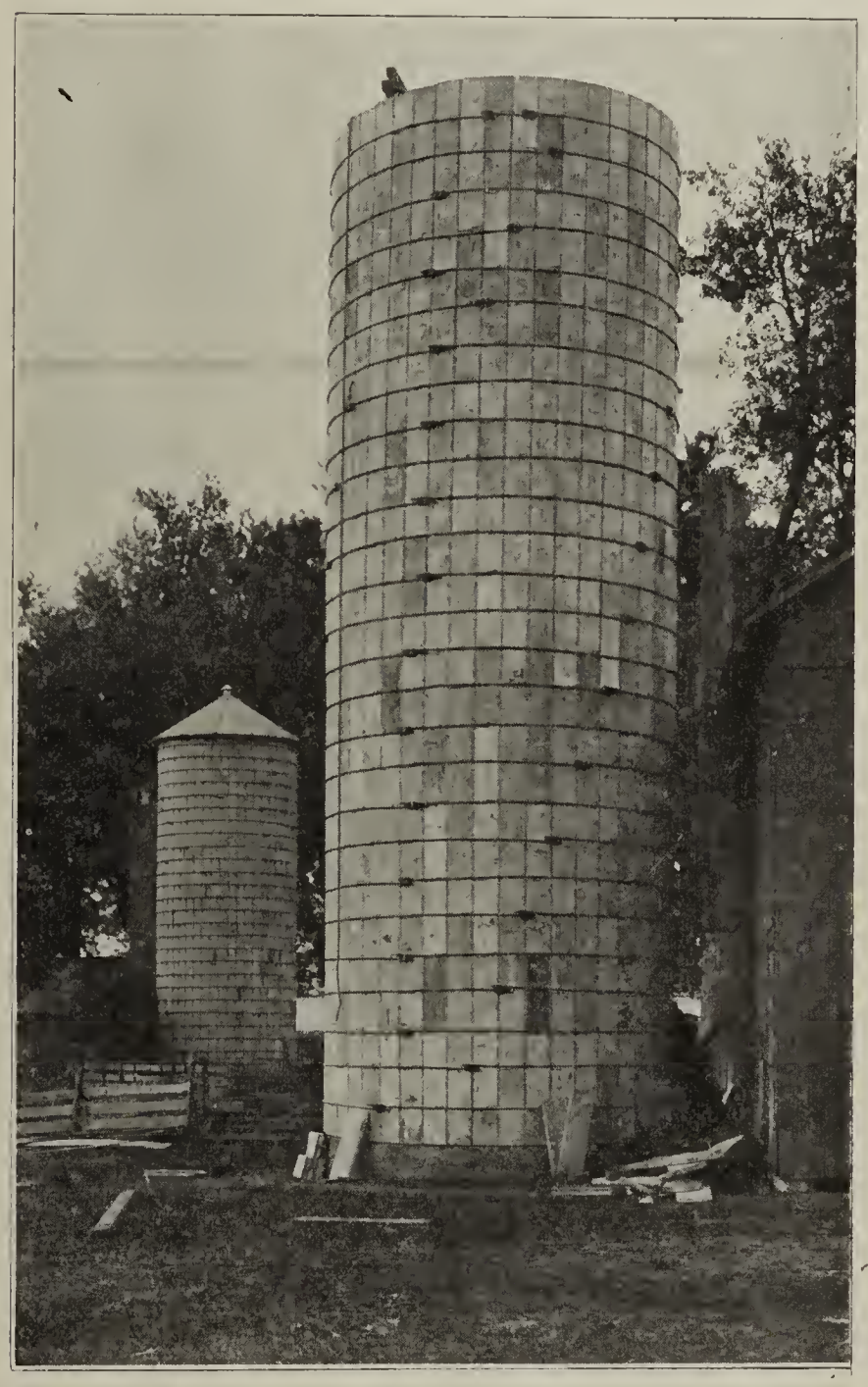
"There is one thing that is retarding the business of concrete silo building," reports a prominent manufacturer of monolithic silo forms; "and that is the scarcity of live, energetic concrete men who are equipped to build them at the right cost of operation. We are receiving letters every day from farmers all over the United States who want concrete silos, but we are forced to see the sales go by because there is no contractor on the ground to cinch the bargain."

The prospects for the 1918 building season are looming up large and much earlier than usual. Correspondence from established contractors confirms this opinion and reports from agents and traveling salesmen endorse it. This extract from a letter recently received from the South is a fair sample of what is coming in from all agricultural districts: "Farmers are certainly interested in permanent silos—we already have prospects for contracts that will keep our present equipment busy. We will be in the market for more machines a little later—we are starting our advertising campaign now."

The business is, of course, new in some sections of the country. But that makes the opportunity all the larger to the right kind of a cement man; and, once he has seized the opportunity, it makes his profits all the bigger.

One mistake that many contractors are making is waiting too late to get started. The proper time to talk silos to farmers is in the winter, while they have the leisure time and are willing and eager to go over the facts and figures. A certain amount of advertising is available, and this advertising must be attended to considerably in advance of the building season.

This year will set a new high record in the matter of concrete silo construction. Whether the monolithic, the stave, or concrete block types are employed, the demand is the same. The increasing appreciation of the silo among farmers has also served to demonstrate the fallacy of the wood stave, metal, or clay products silos. We venture to say that now there is not an owner of any of these latter types of silos who is not wondering why the concrete silo was not selected. This, then, is the time to "sound" the farmer on silos. The farmer who is still without one has absolutely no grounds for evasion. The farmer who has other than a concrete silo is pretty nearly ready to talk concrete. And here is the important point for the cement man—no more profitable work can he find to keep him busy all season that can be found in silo construction. Within the last seven years more than sixty thousand concrete silos of some form of construction have been erected in the corn belt states. In the Elgin



**Caldwell Concrete Staves, Made by the Co-Operative Concrete Construction Co., Oskaloosa, Ia., Were Used in Constructing This Silo**

dairy district, near Chicago, there are upwards of eight hundred concrete stave silos erected in the last six years.

The silo business is in its infancy. The hundreds of thousands of acres of soft corn in the Iowa fields in last year's crop has taught the corn grower a valuable lesson. He has found, if he was without a silo, that this soft corn was of very little value and he also found that his neighbor who had a silo filled with this soft corn had a valuable feed.

## Selling the Goods

The success of concrete silos of all these several types is now unquestioned. Contractors equipped with movable silo forms for monolithic construction do a nice business, increasing in volume each year. Silo block makers and concrete stave makers often have a double opportunity for profit—first, manufacturing the concrete units, and

then erecting them into the silo wall. Some sell the units outright to farmers and to building contractors.

After all, it is the selling end of this business (the same as any other) on which success depends. Even the best of things do not sell themselves. Energetic business methods and salesmanship are required.

Several of the silo equipment and machine manufacturers help their customers in many substantial ways to get started right in the sales department. One form manufacturer writes regarding this as follows:

"In our own work we have found it advantageous to plan in detail the advertising and organization plans for our beginning contractors. We have worked out a set of letters, advertising copy, and general business-getting scheme that is accomplishing much for both new and old contractors. Experience has shown us time and time again that farmers take rapidly to the concrete silo when the proposition is presented to them in the right way."

in a state—for no man could handle more than a limited territory—but even so, it would make many a cement contractor rich; and the wide-awake, progressive cement man will not let the opportunity slip.

The number of silos in use is a pretty good barometer of the agricultural progressiveness of a state. Among the various states, Wisconsin is far ahead in the use of silos, there now being 53,000 in that state, which has a total of 177,127 farms. Illinois ranks next with 24,500 silos and 251,872 farms; while Iowa follows close with 20,150 silos and 217,044 farms. Missouri would seem to furnish the most fertile field for the introduction of silos, as it is credited with 277,244 farms, though Ohio follows closely with 272,045, Illinois and Iowa coming next, then Indiana, with 215,485 farms, and Michigan with 206,960 farms. In the use of silos, Ohio, Indiana, Michigan, Missouri and Kansas are all ahead of Nebraska, which stands eleventh on the list,

**An Excellent Example of Barn and Silos Built of Concrete Blocks**

## The Silo Is Calling You

If your tympanum is not cracked, and you care a chicken's kick about listening to what is going on, you can surely hear the call if the silo, like the birds hear the call of spring, or the cooped-up city people hear the call of the wild at this delightful season. To the farmer, the silo is the watch-tower of prosperity; to the cement man, it is the sign and symbol of golden opportunity.

Just consider for a moment the number of farms there are in this country—about six and one-half million. Think what this would mean for the silo builder if the owner of each one of these farms should decide to build only one silo—and many of them need two or three. The volume of business would be enormous; it would also be secure, undisturbed by war's alarms. True, the great profits of this construction business would be divided by the number of the states, and probably also by a fraction of the number of counties with 129,678 farms, and as yet only 4,500 silos. The Nebraska field for the silo builder is therefore one of special promise, as the farmers there are already awakened to a realization of the value of the silo method of storing feed for live stock.

Mr. Cement Man, it will be well to study the opportunity here presented. Write to the manufacturers of silo forms, and let them explain how they can start you in a profitable business.

## Westinghouse Electric Acquires New Plant

The Westinghouse Electric and Manufacturing Company has leased for a period of years, the Baxter Stove Company, Mansfield, Ohio, with the intention of consolidating at this plant the manufacture of its heating appliances now being carried on at some of the other Westinghouse plants.

# *Industrial Housing Problems*

## If We Want Respectable and Intelligent Men and Women to Work in Our Factories We Must See That They Have Decent, Healthy and Comfortable Homes. Six Cement Companies Who Recently Analyzed Their Labor Turnover for a Period of Three Years, Report an Average of 103 Per Cent Per Annum.

(Continued from February Issue)

There should be in every home enough bedrooms for the parents and the children of either sex to sleep apart. A good-sized bedroom should be provided for parents (and infant children) and two smaller bedrooms, large enough to accommodate two persons each for the other children. All families, of course, are not of the same size, and some larger and smaller houses will be needed; but as a rule it will be found that the larger demand is for the four-room, five-room and six-room houses.

It seems to be a matter of habit in many quarters to build nothing but six-room houses; this is a manifest hardship to those who do not need so many rooms. If a man cannot afford to rent a six-room house and does not need the accommodations and yet finds that the six-room house is the only accommodation he can gain, he has to take in lodgers to help pay the rent. From the social standpoint the lodger is generally considered to be a menace and an unmixed evil. We have found that where we built four-room houses these were often taken up first of all by the employes.

Where houses are built to sell, however, there is not so much demand for the smaller houses and the six-room house is as a rule the smallest house that one can count upon selling without difficulty.

The size of the bedroom should be sufficient to give at least 400 cubic feet of air space per inmate. All bedrooms should open onto a hall and not into each other or into a living-room.

Next, there must be provided at least one living-room (having an area of not less than 135 square feet) for working, eating, washing and general use. There is much controversy on the subject of separate dining-rooms and separate parlors, which add much to the attractiveness of the house but also to its expense, and it is not always possible to provide them for the unskilled laborer.

The foreigner does not use a kitchen, dining-room and parlor; what he needs is one large kitchen. It is found that where three living-rooms are provided, two of them are invariably used as bedrooms for the lodgers. It is the habit of most foreigners and indeed of many Americans to live in their kitchens, and this room should be large and well-lighted and ventilated.

The toilet-room must be planned so that is does not open directly into a living-room or bedroom, but off the stairs if possible.

There is no justification at the present day for the existence of the old style out-closets or privies. Water-closets connected to cesspools are sometimes satisfactory, but very undesirable, especially in cities. It is much wiser to figure on the construction of a sewer at the time the house is built, as cesspools, unless properly looked after, are a potential source of danger to the water supply and a menace to the public health.

Some comment will naturally be made on the suggested omission of the cellar. We are told that the family needs a cellar for the storage of coal and canned fruit, and that it costs no more to build it than to leave it out, as the foundation walls are the same in either case. In investigating the contents of laborers' cellars the writer has never found large supplies of food or fuel. The laborer is too poor to buy more than two or three hundred pounds of coal at a time, and never lays in stocks of food in advance; instead of this we usually find in his cellar a miscellaneous assortment of most insanitary rubbish and junk, which is not only undesirable but constitutes a serious fire menace. Statistics show that over 80 per cent of dwelling-house fires start in the cellar in such rubbish piles.

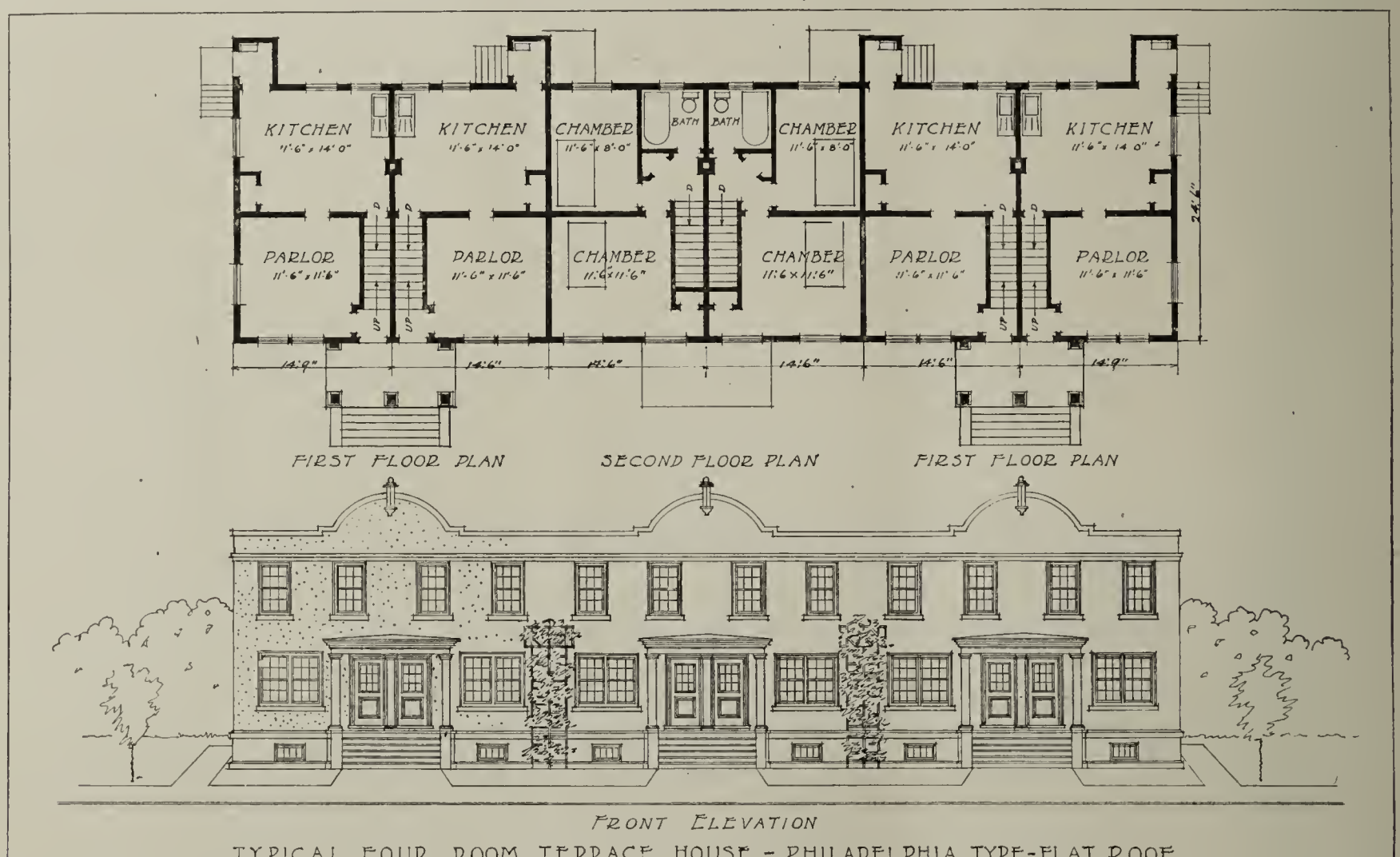
The argument that it costs no more is nearly true where sand and gravel soils are encountered but in clay or other hard digging the extra cost of digging the cellar mounts up considerably. Cellars are not needed for furnaces where the tenant cannot afford the fuel for them but derives his heat from his kitchen stove.

Where the cellar is omitted a space should be left under the floor, ventilated by gratings in the outside walls which will be closed in cold weather.

In houses of this class the tenant usually furnishes his own stove, and as his stove has no hot-water front, a

**One Hundred Concrete Houses Recently Built at Donora, Pa., by the American Steel and Wire Co. These Houses, Built with Steel Forms, Have Six-inch Reinforced Concrete Walls, Stuccoed Outside and Furred and Lathed and Plastered Inside**

system of hot-water piping is of no use to him. Some owners prefer to install the stove with water front and hot-water piping in spite of the increased cost of the house, but all these things help to put up the cost and the resultant rent to a figure higher than the tenant can afford. For the same reasons washbowls in the bathroom and laundry tubs, though useful, are not necessities.




FRONT ELEVATION

TYPICAL FOUR ROOM TERRACE HOUSE - PHILADELPHIA TYPE-FLAT ROOF

There should, however, be an enameled iron sink in the kitchen, and a bathtub should be provided even if the tenant has not learned how to use it. There should be a proper supply of running water, pure, and fit for drinking, and a water-closet connected with the sewer, and a cast-iron enameled bath.

### Materials of Construction.

Very little change has been made in recent years in construction methods and materials, the chief alteration being towards the reduction of fire risks and conflagration hazards.

The standard form of wall construction for rural districts continues to be wooden framing. Where city laws do not forbid it, this is used in the cities. The frame is usually lathed and plastered inside and covered with rough boarding paper and shingles or clapboards outside. Cement stucco on wire lath is coming into vogue for exterior finish—at a slightly higher cost; this when put on satisfactorily requires less maintenance and no repainting, but requires expert workmen to make a satisfactory job. In a few cities brick walls are more frequently used, furred on the inside and lathed and plastered. A few houses here and there have been built with hollow tile, stuccoed outside and plastered inside directly on the tile; and some experiments have been made in concrete houses, although nowhere yet has Edison's dream been realized. The most noteworthy instance of concrete houses are the hundred houses at Donora, Pa., built for the American Steel & Wire Co. by the Aberthaw Construction Company. These houses, built with Lambie steel forms, have 6-inch reinforced concrete walls, stuccoed outside and furred and lathed and palstered inside. The forms, however, give such a smooth surface that it is intended on the next job to leave the concrete exterior surface bare, rubbing any irregularities and leaving a smooth concrete surface of even texture and color.

Although no exact cost data can be given at the present time on the foregoing material, the following figures are, however, given in order to indicate the relative costs of these materials based on present prices. As prices do not vary consistently, these figures may not hold good for very long. In certain localities where clay for tile-making is abundant the prices of tile would be cheap and would indicate that this is the cheapest material to use. In other places where there is a good gravel supply right on the ground the relative cost of concrete would be reduced.

Assuming the cheapest construction, a wood framing, wood lathed and plastered on the inside and rough boarded and shingled on the outside, as our standard or 100 per cent, the relative costs of various houses would be as follows:

Wood framing, inside wood lathed and plastered, outside rough boarded and clapboarded and painted, 102 per cent.

Wood framing, inside wood lathed and plastered, outside wire lathed and stuccoed, 108½ per cent.

Six-inch concrete wall, inside furred and lathed and plastered, outside rubbed smooth, 112 per cent.

Six-inch wall, inside furred and lathed and plastered, outside stuccoed, 116 per cent.

Eight-inch tile, inside plastered direct, outside stuccoed, 111 per cent.

Eight-inch brick wall, inside furred and lathed and plastered, 115½ per cent.

Wood framing, veneered with four-inch brick, inside lathed and plastered, 113 per cent.

The chief roofing materials in use at the present time are wood shingles, asphalted felt shingles, asbestos shingles, slate, tile, "Ready" roofings, tar and gravel built-up roofings and tin roofings, the last three being used for flat roofs.

The cedar shingle, while still in common use, is slowly giving place to other materials. Many cities have legislated against it, and as the asphalted felt shingle, which is a

good deal more fireproof, can be put on for about the same price, it is coming into general use. The cedar shingle is a dangerous fire risk, on account of the ease with which conflagrations spread by burning shingles flying through the air.

The asbestos shingle costs about twice as much, and is not so commonly used, although it makes a more permanent roofing.

The cost of tile and slate roofing is so much higher than the above that they have to be left out of consideration in workmen's houses.

The flat roof covered with a 5-ply built-up tar and gravel roofing is considerably cheaper than any of the preceding, but its appearance is generally objected to. In our large cities, particularly in Philadelphia, it is used extensively, and, on account of the low first cost and maintenance expense, it is very favorably regarded. Various types of ready roofing are used as substitutes for built-up roofs, but, on account of the difficulty in making good water-tight joints they have not come into general favor. The tin covered roof is being used less and less. It is more expensive than the built-up roof and requires frequent repainting and maintenance. One of the stock objections to the flat roof is that it is hot, but, as a matter of fact, this is not the case. The flat roof should have underneath it a ceiling furred down to give a hollow space of at least 18 inches between the ceiling and the roof surface. This dead air space provides a proper insulation against heat and cold, and is actually cooler in summer and warmer in winter than a pitched roof in which the ceilings of the bedrooms are sloping.

The objection to the flat roof on account of its lack of architectural pretensions is not an insuperable one. Conditions of this sort should be a challenge to architects to overcome.

Wood lath and plastering continue to be the customary method of finishing walls and ceilings. Plaster board covered with a finish coat costs very little more, and where speed is essential can be put on and dried out much more quickly. The various wall boards and composition boards offered as substitutes for plastering are not satisfactory for industrial houses. The cost per square foot is low, but the waste in cutting is very great unless specially ordered, and the result is not so permanent.

Interior woodwork is best stained and varnished and not painted, as it is less easily soiled.

Wallpapers add nothing to the comfort or health of the tenant, but do add to the rent he has to pay, besides proving a harborage for vermin. Kitchen and bathroom walls are best painted with lead and oil, while many owners leave all other rooms bare or tint them with cold water paint.

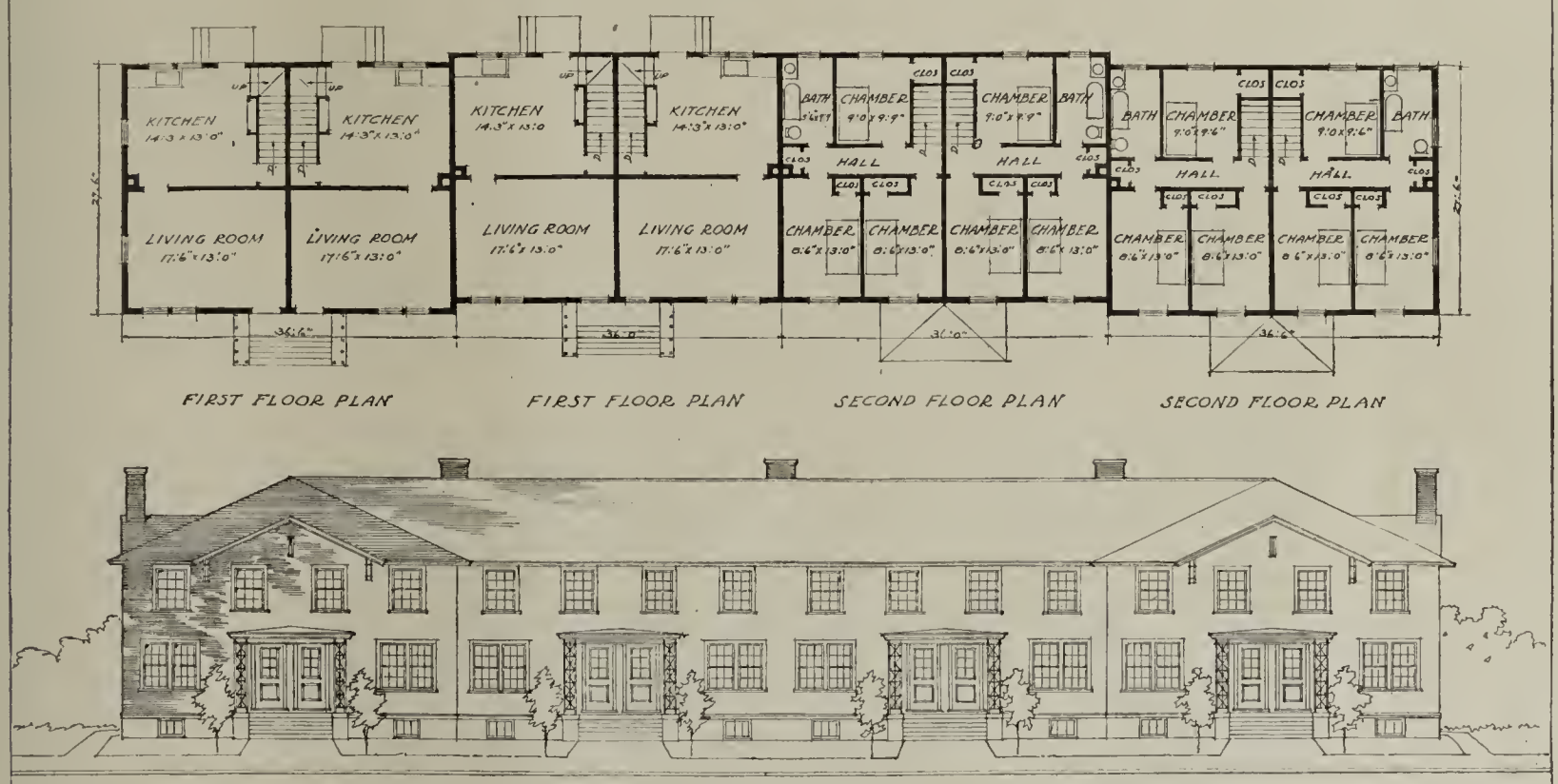
### Architectural Design

In attempting to discuss architectural design we are treading upon difficult ground. No laws or limitations as to style can be laid down, and matters of taste cannot be discussed here. The designer of the workman's house is usually working under very strict limits of cost. It is his duty first of all to plan for the comfort, safety and health of the tenant, and if after this is done he has still some money left for architectural adornment, the money spent in this way is money well spent.

Any attempt to beautify the elevation has to be paid for. Each dormer, every valley, each moulding, porch or railing has to be reckoned up in dollars, and where it becomes a question of sacrificing necessary floor space or internal convenience for outside embellishments, the tenant's vote, if he were given a chance to exercise it, would almost invariably be for the internal necessaries rather than the external luxuries.

In planning a house the square plan bounded by straight lines is the cheapest and most economical. As the plan changes from square to oblong, the ratio of walls to floor space increases, and with it the cost. Any departure from the right angle means increased labor and waste of material in cutting.

Porches should be so designed that they do not shut off sunlight from any room. In many row houses a continuous porch is built right across the front, with the result that sunlight never enters the front room on the ground floor. As sunlight is the greatest foe of




TYPICAL FIVE ROOM TERRACE HOUSE

disease germs, it will be seen what a detriment this is to the health of inmate.

Valleys and dormers in a roof not only add to its cost but to its maintenance, as these angles in the roof are the points where leaks first make their appearance.

No applied architectural ornament can equal the beauty or permanence of a careful planting of trees, shrubs and vines. The plainest of houses suitably planted with quick-growing vines on permanent trellises, and with a good shade tree in front will look far better than the most ornate building elevation and cost much less. In studying photographs of successful housing developments it will be seen that those which win the most general approval are those in which this feature has been given careful attention.

### Layout of Streets

The deadly monotony of straight rows can be avoided by houses set at varying distances from the frontage line, and the appearance of the street can be much improved as well as more light and air being given to each building.

In laying out the street line it will generally be found that the streets which follow contours of the ground, provided these are not too irregular, give a more pleasing effect, and in many cases save large sums of money that would otherwise have to be expended on cut and fill, embankments and retaining walls.

### Size of Lot

No general rule can be laid down as to the size of the lot that should be given the worker. Until the recent movement for home gardening was started it was not customary to find more than one garden in three under cultivation in cities. Many workmen work so hard all day that they have not the time or strength to do any gardening in the evening, and even if they do, ignorance of methods of cultivation and the impossibility of protecting their land from the raids of children in adjoining houses and the neighbors' fowls make it a very discouraging and difficult matter.

In some sections the English scheme of gardening in "allotments" has been tried successfully. In such cases the houses are built on very small lots of land and a reservation of several acres is provided for gardening. This is fenced in and cut up into small allotments and let out in small sections to those who wish to take care of gardens. A garden properly cultivated is a very beneficial thing, but a lot of land which is allowed to become the dumping-ground of dirt and refuse is of no benefit to anybody, but rather the reverse.

In city developments it will probably be found best to give very little land to the tenant, but to use the land that otherwise would have been allowed him in the maintenance of parks and playgrounds for children and allotments for gardening.

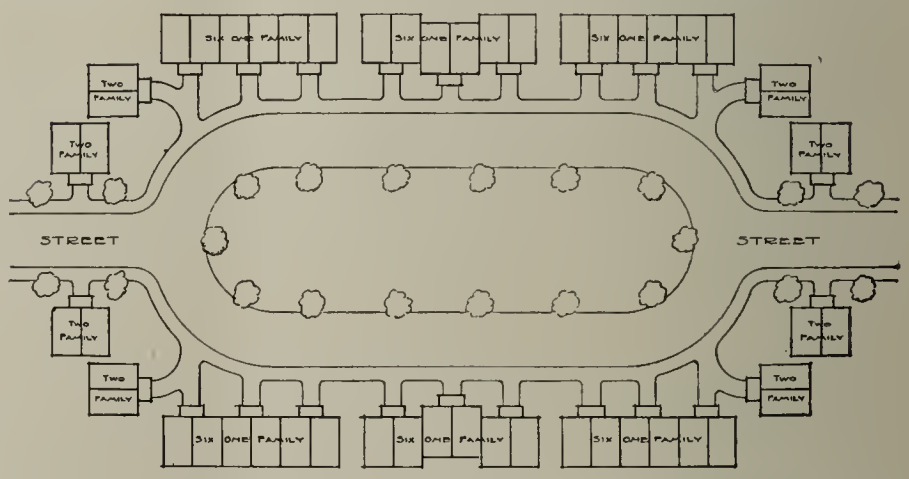
### Benefit of Large Scale Operations

Until quite recently small house construction has been entirely in the hands of the local builder, operating on a small scale. During the past year, however, with the institution of several large housing developments in which speed of construction and durability of workmanship were important essentials, large contracting organizations have taken up this class of work, so that the manufacturer can now get the same kind of service in his house construction as he has been accustomed to get in his plant construction contracts. A good deal of ecenomy is always gained when a large number of houses are built at one time by one contractor. The money saved by purchasing direct from manufacturing firms in carload lots rather than in team-loads from a local dealer, the continuous employment of large gangs of men, the taking of cash discounts and other economies practiced by big contracting organizations are quite a help in reducing costs.

### Selling and Renting Houses

When the houses are built a most important problem presents itself for consideration in the decision as to whether the houses are to be sold to the working men or rented them. No general answer can be given to this question, but a brief statement of the pros and cons can here be given.

If the houses are sold to the workmen, there is the objection that if the workmen are fired or leave of their own accord they still retain the house though it is wanted for other workmen; also that if they can sell at a profit, the increment in value which has been put into the house by the presence of the plant goes to the workman, who has not earned it. On the other hand the workman buying his own home and paying for it by installments has to make himself a steady and efficient worker in order to keep up his payments. There are usually more applications to purchase than there are houses to sell.




Therefore the purchasers can be selected from those that are the most likely to remain with the company. The difficulty of firing men is not a pressing one, as the manufacturer's problem today is rather how to hold his men than how to fire them. The employment manager is being kept busy finding new places for men who do not fit in one corner of the plant rather than let them be fired in the old way.

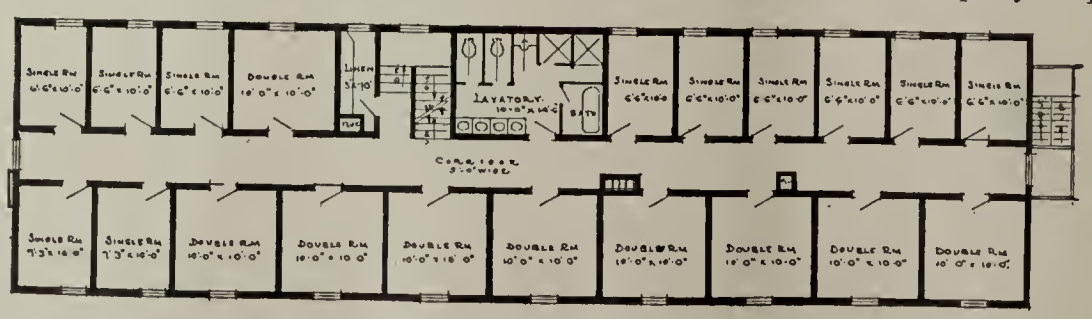
Where houses are rented the owner has more control over them, and can evict tenants who leave his employ. He has, however, the difficulty in strike times of taking care of his property, which otherwise would not concern him.

Labor leaders object to the immobility of labor caused by men owning their homes.

The tendency seems to be today towards the selling of the houses, and several interesting purchase schemes have been evolved by manufacturers.

The Norton Company at Worcester, Mass., have organized a housing company called the Indian Hill Company. Their system of selling is as follows:

The Indian Hill Company require from the purchaser



SECOND & THIRD FLOOR PLAN.

an initial payment of 10 per cent of the purchase price, whereupon a conveyance of the property is made. For the remainder of the purchase price the purchaser gives two notes, one for $1,000 payable in twelve years at 5 per cent, and another for the balance of the purchase price payable on demand with interest at 5 per cent, both notes being secured by a purchase money mortgage.

The purchaser gives also a supplementary agreement to the effect that he will purchase in a co-operative bank five shares, and will continue payments thereon until his deposits shall have matured in the sum of $1,000, which in local banks, at the prevailing rate of interest, takes place in about twelve years. This insures the payment of the twelve-year note according to its terms. It gives the purchaser a feeling of independence, inasmuch as he does not make periodical payments on the principal to the company, and enables him to become acquainted with co-operative bank methods.

agreement is that the purchaser may be assured that at the end of twelve years, or upon his prior death, a sufficient proportion of the purchase price will have been paid so that he or his estate will then own the property free of all incumbrances except a first mortgage for not over 60 per cent of the value of the property, so that at his option he may resort to a bank for a mortgage and be entirely independent of the company.

The company give each purchaser a schedule showing the required monthly payments. The following table is a reproduction of one which was given to a purchaser of one of the 1915 houses, and illustrates very well the method of financing the purchase of an Indian Hill house:

| | |
|---|---|
| Total purchase price | $3,851.50 |
| First payment 10% | 385.15 |
| Borrowed on mortgage, the balance | 3,466.35 |
| Amount due in 12 years, secured by time note | 1,000.00 |
| The balance secured by demand note | 2,466.35 |

In consideration of this agreement the company agrees not to make demand upon the demand note as long as the purchaser shall continue to make monthly payments of interest to the company and monthly payments in accordance with his agreement to the co-operative bank. The company further agrees that if he shall die or become incapacitated within twelve years—provided that at the time he shall not be over sixty years of age—they will accept the surrender value of his co-operative bank shares in full payment of the time note. The result of this

| | | | |
|---|---|---|---|
| Monthly interest during first 12 years | | | 14.45 |
| Monthly payment to co-operative bank | | | 5.00 |
| Total monthly payments during first 12 years | | | 19.45 |
| Monthly interest payment after 12 years | | | 10.30 |
| Total loan | $3,466.35 | Demand loan | 2,466.35 |
| Five per cent | 173.32 | Five per cent | 123.32 |
| 1/12 monthly | 14.45 | 1/12 monthly | 10.30 |

The Massachusetts Homestead Commission advocates the payment of 20 per cent of the purchase price before deeds are passed, and the payment of the whole of the

rest of the cost in equal monthly installments so calculated as to take care of interest, taxes and insurance in twenty years, more or less.

The Goodyear Company in their work at Akron plan to place two mortgages on the property. The first mortgage is for about one half the value of the property, and is carried by an insurance company. The second mortgage is carried by the Goodyear Company, and covers the balance of the purchase price. It is not necessary to make any payment down when the property is purchased. Payments are made semi-monthly which take care of the second mortgage in twelve years and the first mortgage in three years more, the rate of interest being 6 per cent per annum. These periods are the maximum time allowed to pay for the property, but provision is made to allow extra payments to be made if desired, as well as preliminary payments down. The purchaser has the option of taking a diminishing life insurance with the insurance company which, in the event of death, will pay one or both of the mortgages, depending upon the amount of insurance taken. The insurance company has made an attractive group insurance proposition, which brings the cost of this feature down to a very low figure, and have made the purchasing plan very popular.

It is generally found that the workmen are willing to purchase quite high priced houses if the way is made easy for them by one of the methods outlined above.

It is advisable to retain an option on the property where it is sold to the workmen, providing for the repurchase of the house by the company if the workman wishes to leave, some method being set up for the valuation of depreciation, etc. It seems only fair that any unearned increment should pass to the company and not be retained by the workman, as otherwise he is encouraged to speculate in real estate to the disadvantage of the factory owner.

It is very necessary that proper restrictions be placed on the use of the property and the construction of poultry houses, stables, garages, etc.

After a man has been working hard for twelve years or more to pay off the cost of his home, it is likely that he will have gained habits of industry and thrift which will stay with him, and the man will become a permanent asset to the plant. While he has been paying for his house the tie between him and the plant has been one that he has not resented or felt that the owner is to blame for. Many owners have come to think that the system of selling houses is proving to be the best method of securing a contented body of employees around the plant.

It will always be found that very many of the employees, however, are not inclined to purchase, either because they are less thrifty or because, for one reason or another, the ownership of house property does not appeal to them, and houses for rent must be provided for them.

Some real estate companies operating on a large scale have adopted a rebate system by which if the tenant keeps his house in good repair and pays his rent promptly for eleven months he is not required to pay the twelfth month's rent. If at the end of eleven months any interior repairs are required, or if payments for repairs have been made by the company during this period, the tenant pays for these repairs out of his rebate, and whatever balance remains out of his month's rent is remitted, but if the cost of the repairs exceeds the month's rent the difference is paid by the owner. This is, of course, an inducement to the tenant to take care of his property and not vacate a place when the period for rebate is approaching.

### Supervision.

If a housing project is to be really successful, too much emphasis cannot be laid on the strict and careful supervision and education of the tenants. Overcrowding and the lodger evil must be prevented by proper restrictions in the leasing or selling of the property, and a welfare worker or district nurse or friendly rent collector should make periodical inspections for the purpose of seeing that the premises are being kept clean and that the tenants are living decently. It is not essential that this worker be engaged directly by the owner of the houses. In many cases it is far better if the local municipal league or other local organization can be subsidized to take care of these activities.

A welfare worker can often accomplish a great deal in the way of educating the foreigner along sanitary and decent housekeeping lines.

An interesting experiment which is about to be tried is the establishment of a "probationer's" block on the outskirts of a new industrial town. To this block are admitted tenants of negro or foreign birth, and their housekeeping is supervised by a resident superintendent. They are taught American cooking, laundry work, etc., in a welfare building, and when they have proved themselves to be good tenants and agreeable neighbors they are permitted to occupy houses in other parts of the town. This experiment will be watched with a good deal of interest.

### Conclusion.

In this article the writer has endeavored to touch upon the many problems that are still being studied by those who have the welfare of the workmen and the manufacturer at heart. It cannot be stated that any of these problems have yet been finally and satisfactorily solved. All that it is hoped to accomplish in this article is to set forth clearly the main problems in a desire to assist the manufacturer starting a housing venture to form a correct judgment for himself.

If improperly conceived and executed such work can only cause disappointment and regret to those who have invested their money in it, but if carried out properly and thoroughly good housing is one of the finest aids in cementing the good relations of the employer and the employed and of making good citizens and good Americans out of the splendid raw material that is continually being poured into the "melting pot." Present conditions are a disgrace to our country. It is not necessary to apportion blame for this. It is enough if we realize the fact that "evil is wrought by want of thought, as well as by want of heart" and unite to remedy the conditions.

The provision of good housing not only satisfies a local need; it makes for healthier, happier families, and renders a great national service.

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# How to Sell Silos*

## Letters and Methods That Made Good

"Experience," says Kent Merry, manager of the Interlocking Cement Stave Silo Co., Wichita, Kansas, "has led us to conduct our business primarily as a selling organization. We have found that we are able to contract satisfactorily for staves to be manufactured at various points in our territory, thus reducing transportation cost and leaving us the time to create and execute intensive selling campaigns."

Four important factors are the basis of Mr. Merry's success:

1. A constant and intensive use of the right kind of letters and printed matter sent at frequent intervals to selected lists of prospects.
2. Trained salesmen, whose work is introduced and made more easy through the preparation of the prospect by the mail campaign.
3. An adequate contract, providing plainly for all

*The National Cement Stave Silo Association, 1537 Conway Building, Chicago, Ill., has arranged to supply printed matter prepared by a committee, headed by Mr. Merry. Those interested can obtain full particulars and prices on application. Co-operative buying of printed matter will insure high grade matter at a minimum price.

contingencies, issued in triplicate to the manager, the salesman and the customer.

4. The erection is done under the supervision of a trained man furnished by the company and paid at the rate of $3.00 per day by the farmer; the balance of his pay is a per centage of the cost of the silo, paid by the company. The erector secures a receipt that the silo is erected in good shape, before leaving the job.

### The Selling Campaign

The intensive selling begins in December. Four letters go at intervals of a week, and are accompanied by printed circulars. Here are the letters. Remember,

Building a Monolithic Concrete Silo

these letters have been used—that *alone* they won't sell silos—that followed by competent salesmen and backed by a good product they have built up a business running into hundreds of silos yearly—silos all sold at a good profit. Remember that similar methods will sell monolithic silos, concrete pipe, or other products.

### Letter No. 1

Dear Sir—If we can arrange a deal where you can make money on your end without taking any risk and keep on getting cash out of the trade every year without any trouble or expense on your part, will you go into it?

We are in a position to make that kind of a deal with you, and we'll tell you why—

You are feeding live stock.

You are losing at least 40 per cent of the feeding value of your forage crops by not having a silo. Wherever there is waste there is a chance to make money by stopping that waste.

That is our work—stopping waste. We'll build you a cement stave silo that will save your whole crop.

The difference between what you are now losing and what you will save will soon pay for the silo—the kind we build.

The thing to do now is to get the deal started. We are enclosing a folder which will tell you the kind of silo to build. All we need is to know the amount of live stock you are feeding. We can tell you the size to build and how much it will cost.

We'll get all the facts together and let you decide. Feeding costs are going up, and the only way to overcome the higher prices on the things you buy is to reduce the cost of producing what you sell—live stock, for instance, in which there is more money now than ever.

Will you look the folder over and drop us a line tonight? Yours truly,

### Letter No. 2

Dear Sir—In regard to that cement stave silo we wrote you about last week:

You've been thinking about building one for some time, no doubt, because conditions have changed so that some way must be devised on every farm to make every stalk of corn and sprig of hay or clover count. But somehow you haven't gotten around to it. Just why, we don't know.

One thing we do know—

It's no use to wait for a time when materials and labor will cost less. Like as not that time never will come again. As sure as you're alive, we've left the old level of low costs forever. We're on a new plane in farming, in stock raising, in business, in finance, in world politics, and the wise thing to do is to look ahead and build now, before prices take another jump.

As we said in our letter last week, the only way you can offset higher prices on the things you buy is by reducing the cost of producing the things you sell—live stock, for instance, where you have a chance to save a 40 per cent loss in one of your principal crops.

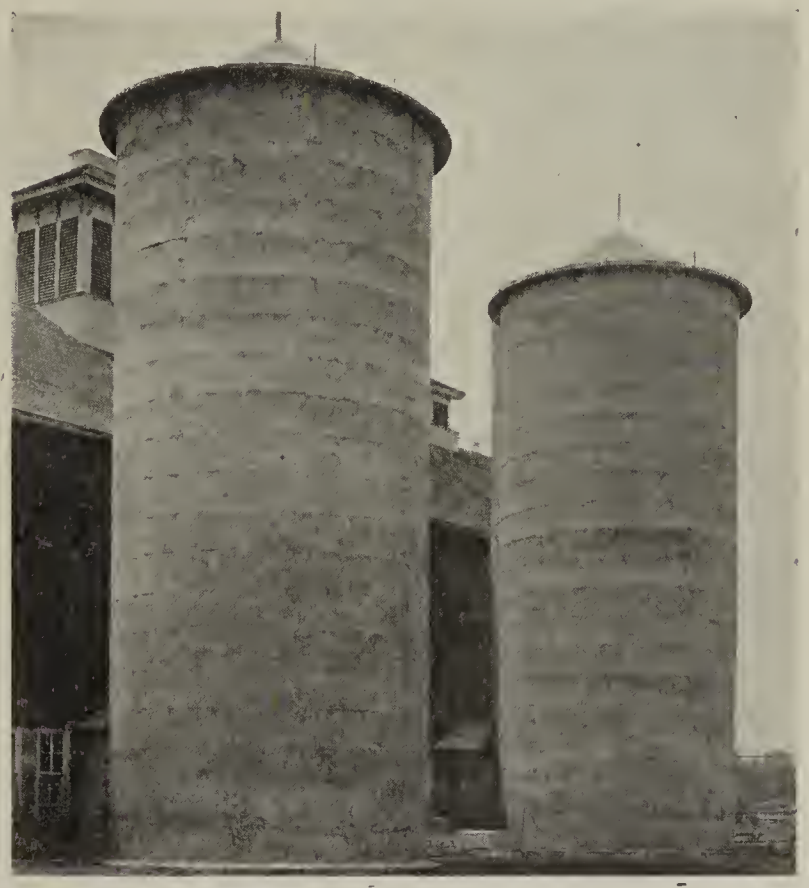
If we can get your order now we are in a position where we can offset the high cost of labor and materials to you by giving you a discount.

In regard to the cement stave silo, as the most practical and efficient type to build, we feel that nothing more need be said. The folder we sent you told the story.

If there are any points on which you need more information, we're here to give you all the facts you may want.

May we hear from you within a few days?

Yours truly,



Two Silos of Solid Concrete Construction, Built with Conklin Forms

### Letter No. 3

Dear Sir—We're back again about that silo—cement stave—you remember.

We don't want you to feel that we are unduly persistent. It's not that. We firmly believe that some day you will build a silo. What we want to make clear is why you should build now.

You may think that we just want to sell another silo. Of course, we do, but there's more in it than that. It's the most practical kind of patriotism, combined with hard business sense, to build silos and to use silos so that every farmer can feed more live stock from the

same acreage. You know the story of ten talents. The time has come when it applies to ten acres as well.

Every farm is a feeding unit, and should be just as efficient as our fighting units at the front.

It isn't a question of being able to afford a silo now. The man who feels he cannot afford it is the one who needs it most.

And least of all you cannot afford to keep putting it off. Materials and labor are uncertain. Ordering your silo early is the only way to escape this uncertainty. You know what prices are today. You don't know what they will be tomorrow.

Give the enclosed booklet a careful reading. Candidly we believe that it is to your financial benefit to build a silo now, instead of waiting longer. You waste while you wait.

Freight movement is easier in the early spring. Later on it is almost certain to become more congested. The thing to do is to get your silo now and be sure of the saving it will make this year.

May we hear from you?

Yours truly,

(Enclosure.)

**Letter No. 4**

Dear Sir—When a man pays for something and doesn't get it, he sets up a howl, and he's got a right to keep on howling until he gets the thing he bought or gets his money back.

You are paying for a silo each year without getting it.

Not paying for it? Certainly you are. Every time you pull an ear of corn and throw away the stalk you're making a partial payment. That stalk in a silo is good food. The value of that feed ought to be buying your silo—not going to waste.

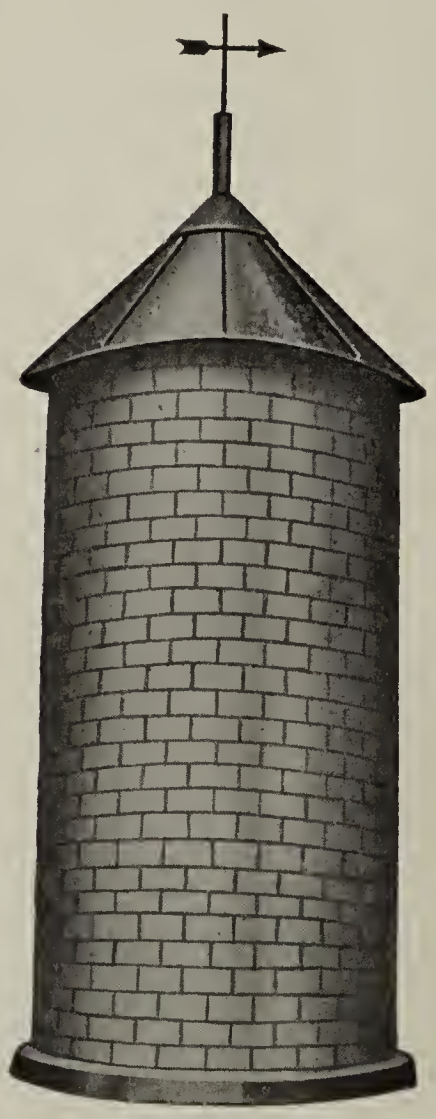
We've said we could show you how you can build a silo even though you think you can't afford it at this time.

If you'll fill out the enclosed card, we'll have facts about your own farm to figure on—not somebody else's farm somewhere else, but your farm—and we're ready right now to back up what we say. If you think we're not, put the facts on the card. That's all we want. If we can't show you, then we'll drop the deal.

We've been making trades like this right along with others, until we've about used up our stock for early delivery. If you want to get in on it, now is the time to act.

As to the kind of silo to build, we still stick to the cement stave. If you know of any reason why we shouldn't, let us know. Fill out the card after supper tonight—or now—and send it along.

Yours truly.

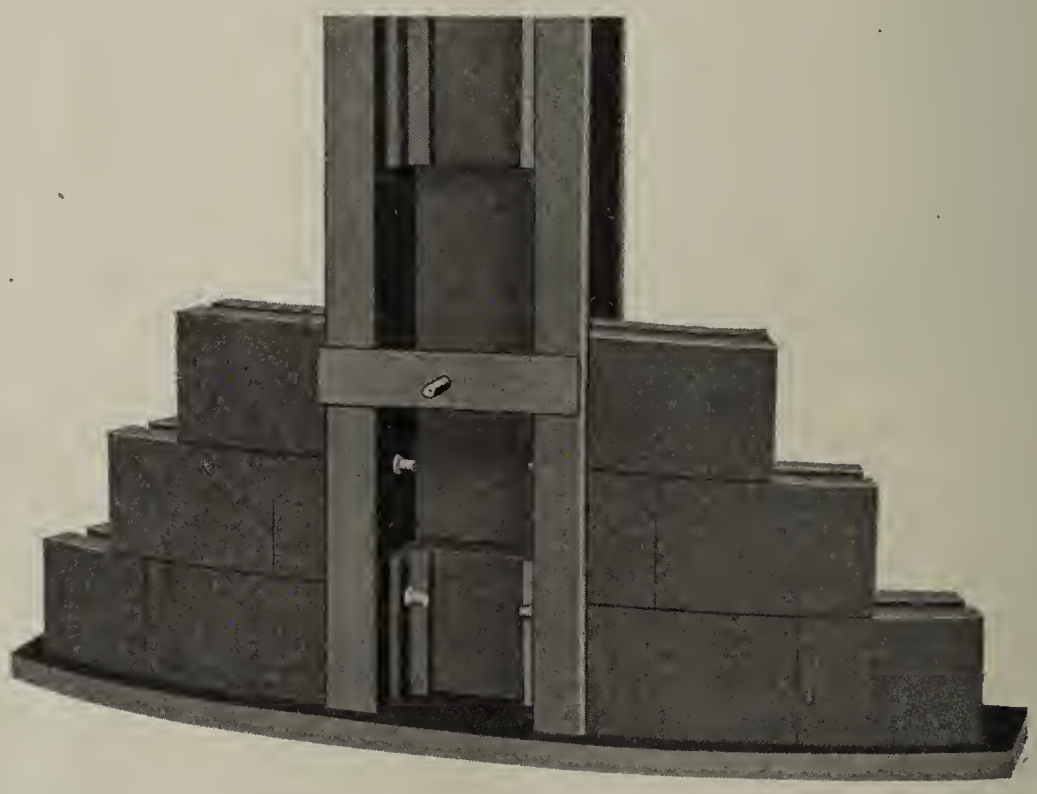


**A Silo Built of Concrete Blocks on the Superior Automatic Silo Block Machine. Easily Constructed. Economical and Airtight.**

## Air-Tight Silo Doors Necessary

Many silo builders are too apt to ignore a point in construction that is really vital for the success of their work, and that is, to install only doors that are air-tight and easy of manipulation. It is an acknowledged fact that the doors and door-frame of any form of silo construction form a vital part of the silo, inasmuch as the combination provides the seal upon which depends the exclusion of air from the ensilage, and thereby determines the keeping qualities of the silo—just as a thoroughly effective seal is necessary to the keeping of preserved fruit or canned vegetables. An absolutely air-tight and moisture-resisting wall may be provided in the construction of a silo—just as a perfect bottle, can, or other container may be provided in the canning of fruit or vegetables; but with a defective seal, these provisions are useless. The principle of canned corn applies throughout to ensiling the corn crop, and an air-tight seal is as necessary in the proper preservation of ensilage as in the keeping of canned fruit or vegetables.

Many concrete builders who are now erecting silos work hardship to the concrete business in general by an improper or at best an incomplete handling of this



**Miller Steel Door Frame Set in Cement Blocks Made by the Superior Automatic Machine. Without a good door frame it is impossible to build a good silo. The Miller Steel Door Frame is so constructed that the doors are air tight without using any kind of packing on the doors. The door rests on all four sides on a point of contact one-eighth of an inch wide and one-sixteenth of an inch raise and with a pressure of 150 pounds against the door will make an impression on the wooden door that will make it absolutely air tight**

important feature, providing only a "hole in the wall" for doors and doorway, and leaving the farmer-buyer to provide some method of closing or sealing the silo. Left to his own resources, the farmer will oftentimes arrange some ineffective, impractical, and unsatisfactory means of sealing the ensilage and of ascending and entering the silo. A properly constructed door and door-frame, carrying with it a convenient, safe, and practical means of ascending the silo, built in the many concrete silos which are to be erected throughout the country this season, would result in thoroughly pleased users of these silos, and would immeasurably boost the silo industry. A neat, well-finished, workmanlike job will secure the payment of the bill by the farmer-buyer; but when in actual use, the inconvenience and impracticability of the makeshift door and door-frame—or no door at all, as provided by many builders—will injure the concrete silo business to a great extent in the community where such jobs are erected.

## Safety Problems

"Safety Problems in Handling Materials and Supplies by Hand, Trucking and Piling," was the subject discussed at a meeting of the New York local of the National Safety Council, held on March 7 in the American Museum of Safety, 14 West Twenty-fourth street, New York. It was pointed out that thirty per cent of industrial accidents occur in the handling of materials and supplies. To prevent such accidents, it was determined, was a problem of the utmost importance and for this reason the organization selected this for its topic of discussion.

The meeting marked the inauguration of a nation-wide campaign to reduce the number of this class of accidents. The importance of solving the problem, especially while the country is at war and may have to call on many of the country's workmen, attracted the largest attendance of members in the history of the organization. About seventy members, representing the big railroad systems, large insurance companies and private industrial plants, attended.

Practical demonstrations in the handling of materials and supplies were given by men trained in such work, a specially constructed stage being used for the purpose. Certain machinery and safety devices on exhibition at the museum were used in the demonstrations.

That the prevention of this kind of accidents was a subject that required the immediate and earnest consideration of the organization was emphasized at the last meeting when a member, representing a large plant, revealed that forty per cent of the workmen had been injured while engaged in handling supplies and materials. There are devices to control this class of accidents, it was pointed out; but the bulk of them are attributal to individual negligence.

The discussion of the subject was opened by Marcus A. Dow, General Safety Agent of the New York Central Railroad, who presented a statement of twenty-one recent accidents with which workmen of the Central road had met. This formed a general basis for the discussion that followed and in which many of those present participated. It was pointed out by Mr. Dow that a record of the New York Central's accidents showed that thirty per cent of them, in 1917, were due to improper and careless handling of freight. In some instances these accidents were caused by unsafe equipment but the majority of them were the result of individual carelessness.

At the next meeting of the local, to be held on April 11, at the Museum of Safety, the subject of "Accidents Due to Labor Turnover" is to be discussed.


## Noah Praised the Archer Mixer

He was so well pleased with the work that the Archer did for him that he wrote us as follows: "Your little Archer Special Mixer is the biggest little mixer I ever saw. It more than fills the bill and is much better than you claim for it. I laid from 1,200 to 1,800 feet of curb and gutter per eight-hour day. The little Archer mixed the topping, too, and made a saving of $9.00 a day over hand mixing."—Noah Bogard, contractor, Washington, Ind.

We used to claim that there was a place on the market for three mixers—the very cheaply constructed low priced machine that did well to complete one job; the very heavy well made high priced machine, and the end discharge Archer. Now we have revised this idea. There is reason for only one—The Archer.

It is cheaper than the lowest priced machine made because it saves so much time and will do the work with a smaller gang, thus saving in wages. As Alex Storric wrote, "I have often run over 30 yards on bridge in eight hours with only five men." This means a saving that is the contractor's profit.

And it is of such large capacity, even if small in size, that it does the same amount of work as the big high-priced mixers and the contractor does not have so much money tied up in his equipment.

Regarding quality, we doubt if any of the highest priced mixers can equal the record as reported by Charles Anderson of one 10-cent screw as the total repair cost in three years.

The great big advantage of the Archer is found in its exclusive end-discharge feature. Because of this mounting the Archer can be pushed right up to the forms and the wet mix discharged direct into place without any wheelers being needed.

W. H. Grammer wrote us, featuring another big point, "I have been in the concrete business for nine years and have operated six mixers and can honestly say that the Archer has given more satisfaction than any or all of them. It looks small, is small; but it measures up to man's size in getting out the work. In addition to the quantity of material it handles is the ability to move quickly and get to work. I have run from 35 to 40 yards per day right along."

This ease of handling and the quick discharge direct into the form has put the Archer so far ahead that now some imitators are appearing. And they have to do all the trial work we are through with. We have proven that the Archer is the cheapest best little mixer for any kind of work—and the price is so low that there is not a big layout of money for equipment. Write to the Archer Iron Works, 2514 West Thirty-fourth Place, Chicago, for literature and trial offer.

# Help Solve the Transportation Problem

## CONCRETE SUGGESTIONS TO SHIPPERS BY THE NATIONAL ORGANIZATION OF BUSINESS PAPERS

The growing menace of the freight transportation situation has induced the Associated Business Papers, Inc., New York, through their Executive Committee, to formulate a plan of definite, practical co-operation by shippers to relieve terminal congestion and keep freight moving.

The following plan calls for ACTION now, and shippers everywhere are urged to bring it to the attention of the proper organizations for that purpose.

To win this war we must do things. Do them quickly, with less labor and less waste. We must increase valuable activity and decrease wasteful activity. We are at present suffering from a decrease of activity all along the line. This decrease comes from the inadequacy of the distribution system. It is time for the producer of raw material, the manufacturer, the warehouseman, the jobber and the dealer to understand that distribution, the movement of materials from the point of production to the point of fabrication and the movement of goods from the point of fabrication to the point of consumption is the foundation of all industrial endeavor.

### Government Needs Your Co-Operation

Neither the efficient control of government bodies, nor the wisdom of the railroad men can solve the whole problem. A large part of the difficulty is the local and short haul difficulty, resulting in congestion which extends back into the main arteries of transportation. It is time for the business man in all lines of endeavor to realize that he is not merely a buyer of transportation, at a price per mile or per ton, but that adequate transportation service is absolutely necessary to the profits of his business. At the present time the interest charges on goods in transit frequently amount to very much more than double the cost of transportation, while the cost of waste, due to inability to secure materials, and ship goods, runs into much larger figures.

For these reasons all men who secure their livelihood from the production of materials or goods and the sale of those products, should be interested in pushing for these items, which will enable us to build up an adequate transportation system.

The government has now assumed control of the railroads, and Director General McAdee has surrounded himself with an able staff of practical and successful railroad operators. A National Highway Committee has been appointed with Rod D. Chapin, president of the Hudson Motor Car Company, as its head, and the Board of National Waterways Association is working with the official committee on this problem. Under these circumstances, and having in mind that we have not in our industries displayed any well organized effort to aid in the solution of the traffic problem, it is our recommendation that the matter will be best served by our full co-operation with these governmental bodies. It is time to quit kicking about rules which are established in the endeavor to clean up the situation, and to co-operate in such a whole-hearted and intelligent way that the tangle of transportation difficulty may be more rapidly untied and the situation cleared in record time.

It is recommended for this reason that, generally speaking, the shipper should be urged to foster movements in the following directions:

### For the Improvement of Railroad Service

1. The provision of adequate rules to secure the full efficiency of transportation service.
2. This includes establishing proper charges for freight and demurrage and the enforcement of equitable rules for loading and unloading, shipping and packing.

### For the Highways

1. The extension of paved highways.
2. Provision for keeping these highways open at all seasons.
3. Proper provision for the maintenance of these highways.

### For the Waterways

1. The construction of barges and small tow boats to provide for the adequate use of existing highways.
2. Provision for putting into shape existing waterways that have been allowed to become obsolute.
3. Provision for the wise extension of these waterways to correlate with the railroad system.

As a measure of relief from the present congestion, it is recommended that the shipper be advised that he can materially aid himself in the improvement of his own transportation conditions and the elimination of the excessive costs of not being able to do business, by carrying out the following suggestions:

### In Connection with the Railroads

1. Co-operate and put it over. Do not kick at changes.
2. Load and unload promptly. Do not wait for a convenient season.
3. Load to capacity.
4. Do not reconsign en route. Decide the destination before the goods leave.
5. Pack securely and mark plainly.

### In Connection with the Highways

1. Make a survey of all the incoming and outgoing freight handled within zones of 10, 25, 50 or 75 miles from your city.
2. Ship all goods to be delivered within the above zones over the road by motor trucks.
3. Demand that all goods to be shipped to merchants in your city and originating within the zones mentioned be delivered by motor trucks.
4. Make a census of all motor trucks in your town available for this work.
5. Take up with your local offices of the national express companies, and your local haulage and express concerns as to how far they can extend their present delivery routes.
6. Select a committee of the best traffic managers of the concerns in your city to lay out a detailed plan to suit your own local conditions and determine upon the fair rates to be charged.
7. Arrange for a sufficient number of receiving platforms or warehouses where you can use horse wagons and motor trucks up to 3-ton capacity to deliver and set down goods, leaving for the larger trucks the running between the main points in the zones. Do not try to make the trucks running overland between the main points do pick-ups and deliveries. It cuts down their efficiency and makes the maintenance of schedules impossible.
8. Put some trucks in the overland haul work on definite leaving schedules so that goods can be delivered to the receiving platforms or warehouses in time to make up full loads to any given points.
9. Arrange a Return Loads Bureau. Arrange with the local telephone companies to give your regular telephone number to any inquirer calling up and asking for

Return Loads Bureau. Post notices in the offices of all of your merchants that you have established a Return Loads Bureau. Post similar notices in conspicuous places in the smaller towns and cities through which trucks running to or from your city will have to pass. This will enable your trucks and those of private truck contractors doing this kind of haulage and entering your city to quickly collect loads to be transported to their home cities.

10. Bring all pressure to bear upon your mayor and the governor and thence to your highway commissioners to keep all the main highways leading out of your city open during the remaining winter months.

11. Bring all pressure to bear on the proper authorities toward the resumption of the construction of main line highways at the earliest possible moment this spring and for a proper maintenance of the roads all year around.

### In Connection with Waterways

1. Secure information upon transportation available on existing waterways covering short hauls.

2. Get behind the movement for immediate production of barges for the large canals, such as the Erie barge canal, which would relieve the freight situation between the lakes, coal regions and the important centers on the Atlantic seaboard.

3. Take up with the traffic manager of your business and the traffic expert of the local chamber of commerce the possibility of the use of waterways for any part of your freight movement and arrange shipping plans accordingly.

## Westinghouse Pittsburgh Service Department Moves

The Pittsburgh Service Department of the Westinghouse Electric and Manufacturing Company has moved from its former location on Amberson avenue, to new quarters at 6905 Susquehanna street, in the Homewood district of Pittsburgh. Express and freight should be consigned to East Liberty, Pa., via Pennsylvania Railroad.

The Automobile Equipment Service Department has also moved to the new location.

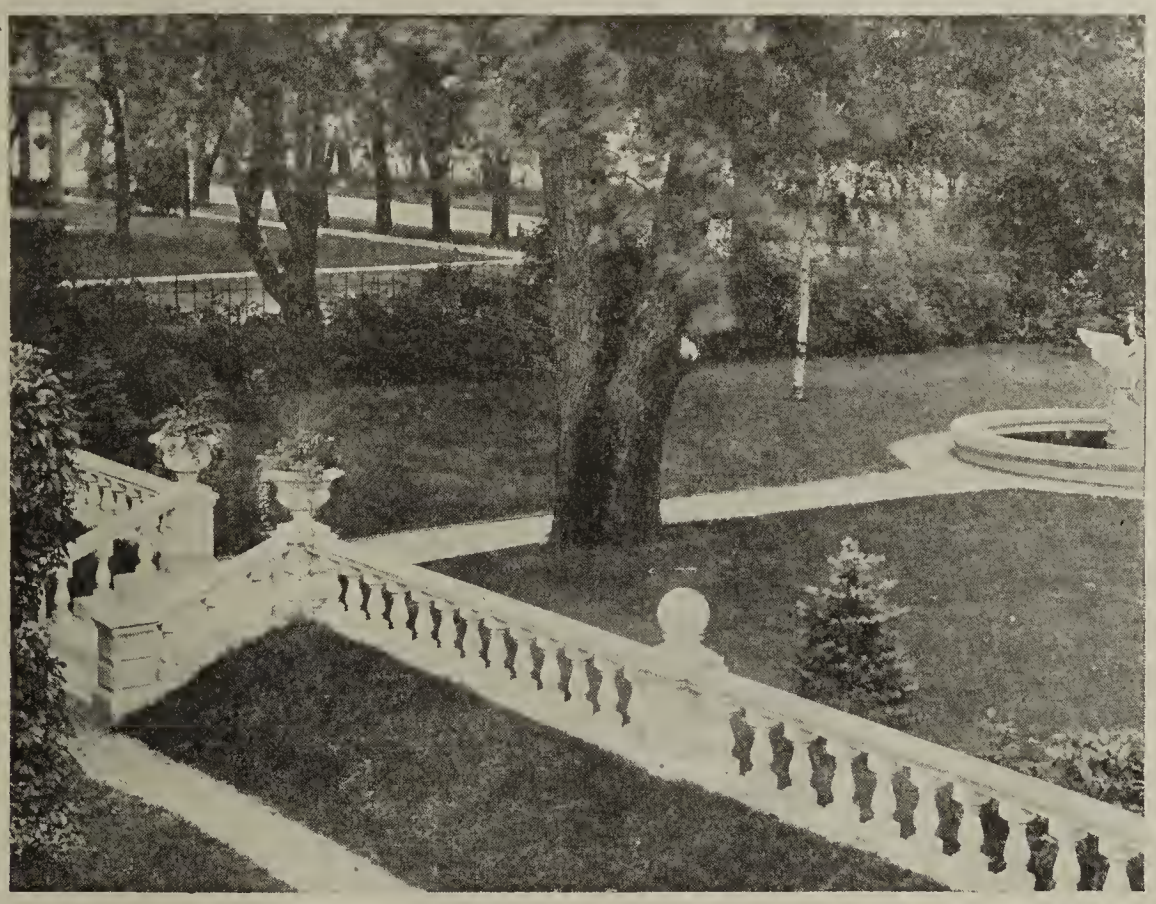
## Concrete Blocks and Hydrated Lime

Joseph V. Godfrey, a concrete building block manufacturer of Morehead, Minn., declares he has had excellent results with hydrated lime in making concrete blocks. He writes as follows: "I now use 1½ sacks cement, 20 pounds hydrate to six cubic feet of sand and make a block that at 30 days old you have to use a 10-pound sledge to smash.

"There are many advantages to Hydrated Lime in blocks. It takes longer to age, but when aged is a dandy."

We had occasion a few days ago to examine some cement blocks made about a year ago in which hydrated lime was used in proportion of 1 to 4, and the blocks appear harder, denser and of better color than those in which no lime was used, writes the Pittsburg Building Material Company of Pittsburg, Kansas.

We are now making some fancy cement columns, mixing with hydrate. Plasterers says "there is nothing like hydrate for white-coating."



**Balustrade Fence of White Cement and White Marble Dust Throughout—Not Plastered. Owner, I. H. Dyer, Hoopston, Ill.; Architect and Engineer, Thos. P. Smith, Hoopston, Ill.; Contractor, Smith & Sons, Hoopston, Ill.**

## Raise Freight Rates on Cement

Increases of about 15 per cent on commodity rates, effective as soon as the railroads file new tariffs, probably within a few weeks, have been granted by the Interstate Commerce Commission to lines east of the Mississippi and north of the Ohio and Potomac rivers.

The new rates, approved by the commission yesterday, supplement a similar increased allowed last June in class rates and apply only to articles shipped in large quantities, such as coal, brick, grain, foodstuffs, all stone, cement, lumber and other staples shipped under "commodity" classification.

The increase does not effect western or southern territory, except for shipments originating in the East and destined West or South, or originating West or South and destined East. About $58,000,000 will be added to the revenue of the eastern roads by the new rates, although the railroads' earnings actually will not be increased because the sum will revert to government under the system of common operation and the roads will be paid on the basis of a fixed compensation outlined in the railroad control bill.

# Operating Cost of Highways

By A. N. JOHNSON.

*Consulting Engineer, Portland Cement Association*

It is generally conceded that money spent on highway construction is an investment. As such then, it should be subjected to an analysis of all the elements of cost that it may be possible to undertake. It is obvious that the first cost of construction enters into such a calculation and has long been recognized, in fact, it has frequently been the only factor that has been taken into account. Within a comparatively few years the public has come to recognize that upkeep must be considered and that it should influence the extent and character of a given improvement.

There is still a third element which has not been considered specifically in analyzing the cost of a highway. If it were a railroad, it would be classed as operating cost. The operating costs of a highway, while they have not been definitely estimated, have been in some measure recognized; as for example—it has long been the practice to reduce steep grades to such gradients as would make team hauling reasonably comfortable. But no close analysis has been made so as to determine with some exactness how much should be expended in such portion of the work.

With the introduction of motor truck traffic, and the importance that this traffic is going to play in highway economy, we now have before us readily appreciable operating costs. A simple example will make this point clearer—suppose a section of highway under consideration carries, or is estimated to carry 1,000 vehicles a day, the gross weight of which averages 3 tons each, and that this is the average traffic for 300 days during the year; or a total tonnage of 900,000 tons.

Let us examine the effect of hauling this load over 1 per cent of grade for 1 mile. If due allowance is made for the average efficiency of motor vehicle engines, it may be readily computed that there will be required about 4,000 gallons of gasoline to produce the necessary energy, or an approximate cost of $1,000. That is, the lessening of a gradient on a mile of road by 1 per cent reduces the operating cost by $1,000 per year with the amount of tonnage as assumed. The figure 4,000 gallons is based on the assumption that 25 per cent of the energy of the gasoline is effective in overcoming tractive resistance, and that the gasoline is 58 deg. Baume, 124,420 B. t. u. per gallon.

If it were a maintenance charge, this would be considered very heavy, or to look at it from another angle, capitalized at 5 per cent, there would be warranted an expenditure of $20,000 to reduce a mile of grades by 1 per cent.

To determine when a given grade should be reduced by 1 per cent brings into the problem many more factors than we have sufficient data at present for an exact solution. For example, it is probably true that a certain series of grades may be so arranged that due to the length of the road on a down grade there would be an amount of gasoline saved that would compensate for the extra gasoline consumed on the up grade, but if the amount necessary to consume on the up grade was more than could be saved in the distance traveled on down grade, then there should be a reduction of the grade made. The amount to be justified for this expenditure would be determined primarily by the amount of traffic anticipated over the road.

There is another most important factor that must be considered in ascertaining the operating cost over a highway. This factor is the relative resistance different pavement surfaces offer to tractive effort.

Recent tests made in California by the Division of Agricultural Engineering in the University of California, and published by the Good Roads Bureau of the California State Automobile Association, furnish the basis for some very interesting study. The result of these tests was given in pounds tractive effort required per ton load over a number of different types of road surface. The least tractive effort was recorded over a plain concrete road surface where 27.6 pounds was required to pull one ton.

As an example, in applying the relative tractive force required over different surface conditions to operative costs, let us compare a concrete and macadam surface. Over the former, as stated, the tractive force per ton was found to be 21.6 pounds; over the macadam surface, in good condition, it was found to be 64.3 pounds, or a difference of 36.7 pounds per ton load.

The tractive force required to move a one-ton load up 1 per cent grade is 20 pounds, this effort being required in addition to what other frictional resistance, due to the surface of the road, it may be necessary to exert. If we interpret the additional tractive force over the macadam surface as compared with the concrete surface in terms of increased grade, it is seen that it is the same as increasing the grade by 1.8 per cent.

If the same tonnage as assumed before in the increase of 1 per cent grade is taken to be the load over the road, the extra amount of gasoline that will be required to move this tonnage over the macadam surface, as compared with concrete surface, is, therefore, 4,000 times 1.8 or 7,200 gallons of gasoline per mile. That is, the operating costs for this amount of traffic over a concrete surface is, assuming gasoline worth 25 cents per gallon, $1,800 less per mile than over a good macadam surface; or there would be justified, capitalizing this at 5 per cent, an expenditure of $36,000 more per mile to substitute the concrete surface for macadam surface, in the event that any such additional amount were necessary for this purpose.

If the tonnage over a given highway is estimated at less, then the difference would not be as great but whatever it may be, it is evident that it is an essential factor to be taken into consideration before the practical value of the use of any given type of surface can be ascertained.

To be sure this operating cost is not paid out of public funds, but it is nevertheless paid by the public who uses the road, and it is as essential that it be considered in the economy of the highway, as the first cost of construction or the maintenance cost.

The operating cost over thousands of miles of our highways today, if it could be ascertained, would be found to be millions of dollars more than would be the case had the roads been carefully designed and due consideration given to proper grades and surface.

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# Cuban Portland Cement Producing

Although the Cuban Portland Cement Company has been producing cement for the last month the company has not yet reached capacity operations. By the end of the month it is hoped that the company will be producing at capacity, however, which is expected to be at the rate of 600,000 barrels of cement a year. On this basis the management hopes to secure three-quarters of a year's earnings from the 1918 operations. Cement is selling at $4.50 per barrel in Cuba, against a normal price of around $2.30 to $3 per barrel. Where the company originally was expecting to make a profit of $1 per barrel on production, it is now expected that perhaps $2 per barrel may be earned. While it is by no means assured that the company's earnings will average this, it is worth the calculation, at least, to know that on 450,000 barrels production this year and $2 profit per barrel, earnings would be equivalent to better than $8 a share on the outstanding 100,000 shares of stock, after allowing for the full 7 per cent interest on the $1,000,000 bonds.—[Boston Trancript.]

# What Should the Designer of a Concrete Building Know About Its Cost?

With the desire to arouse the interest of the designer to a keener desire to know the cost of his designs, Mr. Clayton W. Mayers of the Aberthaw Construction Company of Boston, in a paper prepared for the American Concrete Institute presents in a very practical way many of the factors of economy in the design of concrete buildings.

"The average concrete designer," frankly says Mr. Mayers, "makes no claim to being an estimator. In fact, he does not think it is necessary to be an estimator even of the materials with which he works. It is a fact that a large majority of men employed in the design of concrete buildings have hardly any idea of the cost of the work they are laying out, and what is more, they do not know how to find out this for themselves. Surely, if an engineer designed a structural steel girder he could tell with reasonable accuracy what it would cost by computing the weight and getting the market price for the structural steel and the labor cost of erection. Estimating the cost of concrete work is a little more complex, but each step is very similar and the process is the same.

"A designer of concrete structures should think continually of costs, but in order to think intelligently of the cost of his work he must know how to calculate approximately the cost of his designs. In no other way is he able to determine which one of his studies will serve his purpose at the least expense.

"It should be borne in mind that in making designs for comparative costs, it is not necessary to work to as great a degree of accuracy as for the finished plans. Rough designs, accompanied by rough sketches, will furnish enough information for his study. In case the comparative costs of two schemes should work out the same, a more careful design might become necessary. A little practice on the part of the designer will soon reveal to him to what degree of accuracy he must work in order to get satisfactory results.

"The process of estimating these various designs for comparative cost purposes is not nearly as difficult as may be supposed. Concrete is measured by the cubic foot or cubic yard, forms by the surface measurement in square feet and reinforcement by the pound or ton. After the quantities have been calculated for the various designs, unit prices are fixed and the total cost of the member estimated. It is usually here that the engineer throws up his hands. In fact, it is very likely that he knows but little about the prices of this class of material and labor, and in his rush of work he has not kept in touch with the fluctations, and feels he does not have time to inform himself properly on this subject. Again, it should be understood that it is not necessary to fix absolutely accurate unit costs to these quantities in order to obtain reasonably accurate cost comparisons. As long as the same unit costs are used for similar types of work in the various designs, the comparative costs will be surprisingly accurate.

"In fact, some of the unit costs may be in error 25 per cent or 30 per cent, and yet the resulting costs will show unquestionably which type of construction should be used. For example, the quantities for two designs (a) and (b) for an interior column are given here and these quantities are priced for current normal conditions, under 'Eestimate A,' and another estimate for the same quantities with the unit prices grossly in error is shown in 'Estimate B.'

| | |
|---|---|
| Estimate A. (Scheme a.) | |
| Conc. (1:1½:3) 52 cu. ft. at 36½c | $18.98 |
| Forms, rd. steel | 15.00 |
| Reinfct. (vert.), 514 lb. at 5c | 25.70 |
| Spirals, 264 lb. at 5½c | 14.52 |
| Lost fl, space, 7/10 sq. ft. at $2.75 | 1.92 |
| Total | $76.12 |
| (Scheme b.) | |
| Conc. (1:1:2), 52 cu. ft. at 43c | $22.36 |
| Forms, rd. steel | 15.00 |
| Reinfct., 245 lb. at 5c' | 12.25 |
| Spirals, 264 lb. at 5½c | 14.52 |
| Lost fl. space, 7/10 sq. ft. at $2.75 | 1.92 |
| Total | $66.05 |
| Estimate A. (Scheme a.) | |
| Conc. (1:1½:3), 52 cu. ft. at 27c | $14.04 |
| Forms, rd. steel | 19.00 |
| Reinfct., 514 lb. at 3¾c | 19.28 |
| Spirals, 264 lb. at 4c | 10.56 |
| Lost fl. space, 7/10 sq. ft. at $3.50 | 2.45 |
| Total | $65.33 |
| (Scheme b.) | |
| Conc. (1:1:2), 52 cu. ft. at 32c | $16.64 |
| Forms, rd. steel | 19.00 |
| Reinfct., 245 lb. at 3¾c | 9.19 |
| Spirals, 264 lb. at 4c | 10.56 |
| Lost fl. space, 7/10 sq. ft. at $3.50 | 2.45 |
| Total | $57.84 |

"It will be seen that although the comparative total costs of the schemes (a) and (b) are entirely different in the two estimates, the resulting comparative costs both in "Estimate A" and "Estimate B" show conclusively the design (b) is the cheaper column to build. It will also be noticed that the percentage of cost saved by using design (b) is about the same in both estimates. However, the alert engineer will soon become as interested in having his unit costs in accordance with current prices of material and labor as he is in having his design correct."

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# Jeffrey Storage Battery Locomotives

Catalog No. 231 of the Jeffrey Manufacturing Co., Columbus, Ohio, describes Jeffrey storage battery locomotives for industrial plants, lumber yards and contractors.

The scarcity of help at the present time and the necessity of speeding up production to meet war-time needs, demands the use of labor-saving machinery for handling materials in and around industrial plants. The Jeffrey storage battery locomotive will help to relieve the situation. One unskilled laborer and a Jeffrey storage battery locomotive will do the work of many men and trucks, and will handle materials faster, at less expense and with less trouble and supervision.

Jeffrey storage battery locomotives are built for heavy service, the frames being constructed of structural steel, re-enforced with cast steel journal pedestals, their rugged construction insuring low cost of upkeep. The flexibility of the track system used and the freedom from fire hazards from hot sparks and cinders, backfires and exhaust gases, permits it to go anywhere about industrial plants with absolute safety.

The catalog contains interesting illustrations and description of various installations, information regarding details, as well as useful data for users of storage battery locomotives.

## Mammoth Gravel Dredge

Dredge No. 1 of the Arundel Sand & Gravel Co., Baltimore, completed recently at the plant of the Arundel Shipbuilding Co. at Fairfield, Md., is the largest sand and gravel dredge ever built. It was designed and built under the direction of Alexander Lindenberg, superintendent. It is 120 feet by 44 feet by 13 feet. Two boilers of 300 horsepower each will operate the machinery. It will be able to dredge to a depth of 65 feet, and has buckets with a capacity of one-half ton each. They are fastened on an endless chain, and 16 buckets a minute will dump into the receiving chamber. It will grade three kinds of gravel and three kinds of sand. The dredged material first goes to the receiver, where it is screened, the sand being first removed and later the gravel. The rock that remains is carried to a crusher, which is adjustable, so that any desired size gravel may be obtained from the rock. From here it is returned to a washer, where all the sand is removed, so that there is no loss whatsoever. All the machinery is placed in the hold, and is operated from an elevated lever-room in the front of the dredge. In the rear are the engine-room, tool shop, machine shop, electric and ice plants, kitchen, storage-room. In the front are the dining-room and six sleeping-rooms, three on a side. Each sleeping-room accommodates three men, providing for a total crew of 18. The dining-room is 32x40 feet. All machinery and equipment for the dredge was also made at the plant.

## Be Sure and Get a License Before You Use Explosives

Nearly every user of explosives knows that Uncle Sam has passed a law requiring all users of, and dealers in explosives to take out a Government license. To those who may not be clear on the matter a little information may be in order:

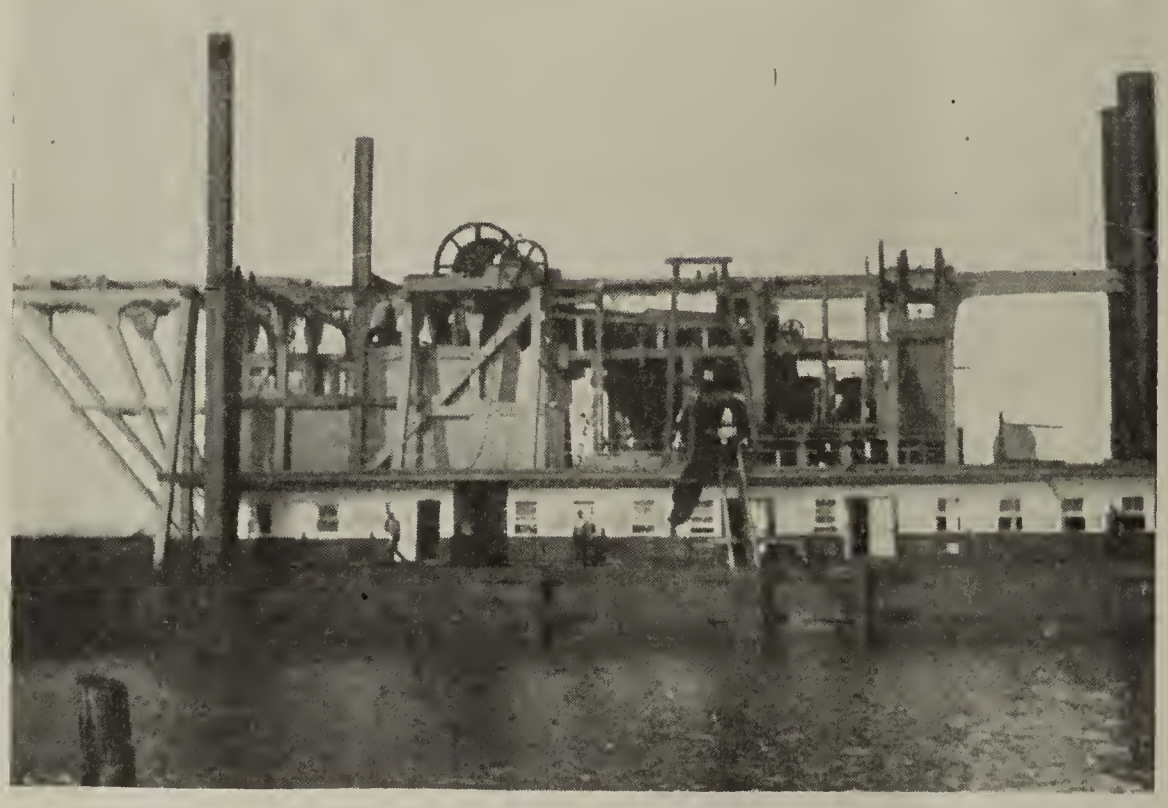
The object of the law is to keep dangerous explosives out of the hands of plotters and alien enemies of the country.

Before a dealer can sell any explosives, he must have a license, and before a customer can purchase any explosives either from a dealer or a manufacturer, he must have a license. Before a customer can secure delivery from a railroad company of any explosives shipped to him, he must show the railroad agent his license.

This license matter is, however, a very simple proposition. It need not deter any one from buying or using explosives if their motives are honest. The license costs only twenty-five cents and can readily be obtained from licensing agents located in every state and every county. As a general thing, county clerks are the proper persons from whom licenses can be secured.

However, any one having any difficulty in locating a licensing agent can obtain the name and address of the nearest agent by writing Bureau of Mines, Explosives Division, Washington, D. C. Dealers stocking explosives will, of course, be able to give customers addresses of licensing agents.

In order to save time, it will be well for any person desiring to purchase explosives to obtain his license before going to his dealer to place an order. If he intends ordering direct from a manufacturer, he must necessarily have his license before ordering because a certified copy of the license which will be furnished by the licensing agent must accompany his order.



Mammoth Gravel Dredge

## Cement Company Shipping Potash

C. Leonardt, president of the Southwestern Portland Cement Company, announced recently that this company will soon ship its first carload of high-grade potash from the by-products plant recently installed at the company's cement plant at Victorville, Cal., in which two tons of potash are reclaimed each day from refuse gases and dust that formerly went to waste.

The company, which is largely a Los Angeles concern, has another plant at El Paso, Texas, where the annual meeting was held.

The officers and directors re-elected for the coming year are C. Leonhardt, president; C. C. Merrill, vice president; F. H. Powell, salesmanager, and W. E. Keller and C. A. Fellows, all of Los Angeles; C. Boettcher and Whitney Newton of Denver; A. Courchesne, James G. McNary

## Concrete Railroad Ties

The American Reinforced Concrete Tie Manufacturing Company, Eagle Pass, Texas, is building a plant for the manufacture of reinforced concrete railroad ties. W. F. Faust is president.

## Cement Now By-Product in Recovering Potash

Cement as a by-product seems to be quite within the possibilities, in a good many instances, as the result of potash recovery systems being installed in cement mills. The latest instance of a recovery system is reported by W. S. Barstow & Co., who are erecting a potash recovery plant for the Ironton Portland Cement Company, where the dust from 2,000 barrels of cement will be handled daily.

Potash salts to the amount of 1,000,000 tons a year and to the value of about $18,000,000 were used in this country yearly before the war. The elimination of German potash, of course, sent the price soaring and stimulated new methods of recovery in this country, made commercially possible by the high prices, but even so it is estimated that not more than 8 per cent of the nation's requirements were supplied last year.

When it was ascertained that the escaping dust from Portland cement plants carried a fair percentage of potash, experiments were undertaken by the Western Precipitation Company, licensees of the Cottrell process of electrical precipitation, for its recovery. After many experiments the method had been perfected, and a year's trial under practical operation has resulted in the result of having a greater income from potash than from cement; or from another point of view the cement has now become the by-product and the owners find themselves from one year's operation with the entire cost of their plant returned to them together with a profit. Operating costs show that the process will be profitable at pre-war prices. The department of agriculture estimates that more than one-third of the country's requirements can be obtained from the now wasted dust of cement plants.

## Builders' Hoist with Single Reversible Drum and Reversible Elevator Sheave

A new line of "Heavy Duty" contractors' hoists was brought out during the past year by the American Cement Machine Co., 9635 Johnson street, Keokuk, Iowa, to meet the demand for moderate priced, substantial and efficient hoisting outfits for the wide range of operations requiring hoisting machinery and especially for the general contracting and building field. The single-drum hoist is especially adapted for the building contractor for operating single or double platform material elevators. It is equipped with the Boss standard hoisting drum and a material elevator sheave. Both are rendered independent of each other by means of simple pin clutches. The hoist is also equipped with two expanding band friction clutches, enabling operator to run either hoisting drum or elevator sheave in either direction, at will. The following operations may be secured with this hoist: (1) Drum may be operated alone in either direction with sheave stationary; (2) sheave may be operated alone in either direction with drum stationary; (3) both drum and sheave may be operated together in either direction. The winding drum may be advantageously used in hauling operations with an endless cable; rehauling being accomplished by reversing the drum. It may also be used in hoisting heavy loads in building construction, when used independent of sheave. The elevator sheave will be found useful at times for running a pump or circular saw, or blower for forge. These hoists can be furnished with or without gasoline engine or equipped with electric motor drive. They are made in three sizes: 5 H.P.; 7 H.P. and 9 H.P.

## The Oregon Cement Plants Report for the Past Year

Ultimate success of the Oregon Portland Cement Company, Oswego, Oregon, is indicated in the company's report for the past year. It shows that slightly over 200,000 barrels of cement were manufactured at a cost of $1.38 a barrel, while the average net selling price was $1.59. Unexpected increases in cost of production and inability to raise selling prices on cement contracted to be sold were responsible for the year's operating profit, reaching no more than $29,000, and this amount was absorbed by the depreciation account and interest on loans.

Assets total $1,767,184. Excluding the outstanding $1,481,911 capital stock, the current liabilities are $29,853, together with $125,419 of borrowed money payable on demand, and $130,000 maturing in March next year.

The company's physical aspects are thus stated in the general manager's report:

"Owing to difficulties experienced with the Roseburg lime quarry, both in taking out rock and in getting cars to move it to Oswego, the output of cement in 1917 fell below expectations. This quarry is a disappointment, to the extent that the deposit is not solid rock, but of boulder formation, the interstices of the rock being filled with clay. This has increased quarrying cost, as well as making it difficult to take out sufficient rock at all times.

"While there is little of encouragement in this respect of our Roseburg quarry, quite the reverse is true of Dallas. Work here the past year has opened the quarry very well, and the top ledges of high-grade cement rock are now about 13 feet thick, and we have uncovered enough to keep the Oswego plant supplied throughout 1918 without more stripping.

"By using this top ledge alone while we have had to mix in some rock of lower quality, we can manufacture cement successfully by using daily a little over four cars from Dallas and a little under two cars from Roseburg, or just the reverse in quantities of these two rocks as in the past year. The accessibility of the Dallas rock, the lower freight rate and the certainty of car supply from this point will enable a very considerable saving over last year's manufacturing cost, while the fact that we will be able to run the factory more continuously will make further reduction.

"In all departments of the Oswego plant we have been able to manufacture cement as cheaply, or more so, than any of the other factories on the Pacific coast, and the product has maintained a high standard. Our brand is well known throughout the state, and we have received no complaint as to its excellence for all classes of work.

"The selling price of cement the past year, although 20 cents a barrel higher than in 1916, did not adequately repay this company for the very much higher cost of labor and materials. The advance in price, made at the end of May, was too late in the year, and many contracts had been already taken at the lower price, resulting in a low average selling cost. The market price of cement in Portland now is 25 cents higher than in 1917, and the advance was made the first of this year.

"Our investigations lead us to believe that a very much greater amount of cement will be used this year than in 1917, and we are in better shape to supply the market than ever before. The prospects for this year are more encouraging, and I feel the success of the company is assured."

## Cement Plant Closed

The Sandusky Cement Company, Dixon, Ill., has had to close its plant on account of the shortage of coal.

# The Opportunity of the Small Quarry

One period in the development of man is called the Stone Age, at which time fragments of rock were used to make cumbersome, but rather effective, mauls for cracking heads; later peoples used larger amounts of stone in various forms to build houses, temples and tombs, and adopted somewhat more convenient methods of exterminating the unfriendly; today the use of stone is much more extensive and single American quarries have been crushing and marketing annually heaps of stone that would shame in size the most stupendous pyramid or sacred temple of the ancients.

Crushed stone in one form or another is an important part of practically every class of buildings and public improvements. It is required in the construction and repair of streets, roads, railroads, wharves, factories and buildings. The art of quarrying and preparing the stone has been highly developed and millions of tons of crushed stone are hauled annually by the railroads to meet the already large and ever-increasing demand.

Practically all open-top cars suitable for hauling stone are now requisitioned for hauling coal and other bulky materials to supply the army and navy and industries contributing to their immediate support and development. This will probably interfere with the shipment of stone for various purposes for some time, and many contractors have already suspended operations on road building and repair, bridge approaches and other work that should be pushed to rapid completion, because of the limited amount of broken stone available. Many of these contractors have in the past depended on stone shipped considerable distances.

In the immediate neighborhood of the work, large amounts of suitable stone are frequently to be found, and the possibilities of opening small quarries or utilizing masses of boulders are left undeveloped. In some cases this stone is as good, or better than the stone specified for the job. The reason for this neglect has been because of the greater economy and convenience in handling stone from the larger crushing plants. At this time of limited shipping, small portable crushers can be used in the working of the nearby and readily available stone to the best advantage. The distances are so small that teams and trucks can be used in delivering the stone so that the jobs can be completed and others begun without delay.

When small local quarries are nearby they can in many instances be depended on for immediate delivery of small orders and can be rapidly enlarged to meet the full requirements of the job. In other cases it will be necessary to develop entirely new faces, but, if the work is undertaken in time, they can be made to yield a sufficiency of stone with a minimum of delay and overhead cost.

There is more need of improving our roads than ever before. In time of war road maintenance is an essential part of our system of national defense which cannot be deferred. In the light of the priority rulings the supplying of crushed stone for road building is distinctly up to the small, local quarry.

Developing a Small Quarry to Meet an Emergency Demand for Stone.

# Belt Dressing

The Sawyer Belting Company of Cleveland are calling the attention of the trade to the advantages derived from the use of their Sawyer Belt Dressing, which, when applied regularly, aids materially in prolonging the life of the belt. It keeps the belt soft and pliable, at the same time increasing pulley power, because with the use of dressing the belt can be run "slack."

As manufacturers of the very highest grade of Stitched Canvas Belting, this company is in a positio nto know what is necessary in a belt dressing; what ingredients are the best for preserving and keeping the belt pliable.

Every manufacturer desires to have his product last as long as possible, and for that reason he uses extreme care in the manufacture or selection of any other product that is used in connection with it.

And so it is with Sawyer Belt Dressing. It has the same good reputation that the belting has.

# The Use of Electric Motors and Belt Conveyors in Building 223 Concrete Tanks 105 Ft. High

In mixing and placing 85,000 cu. yd. of concrete for the 223 grain elevator tanks of the Calumet Terminal Elevator of the Chicago & Northwestern Ry., electric motors aggregating nearly 520 HP. were used. The three mixers, the belt conveyors that handled the aggregates and the concrete, the three towers from which the concrete was chuted, and all the accessory apparatus were electrically driven. The power to drive all this machinery averaged only 1.2 kilowatt hours per cubic yard of concrete at a cost of 2.8 ct. per kilowatt hour; hence the cost of power was exceedingly low. In addition there was used about 0.2 kilowatt hour per cubic yard of concrete for lighting, for 600 lamps of 60 watts each used to illuminate the job at night. With a working day 22 hours long the best month's output was about 20,000 cu. yd. of concrete, and the maximum demand for power and light was 114 KW.

The grain tanks are 15 to 22½ ft. diameter and 105 ft. high. Each tower equipped with a 90 HP. motor, was used to hoist a 1-yd. concrete bucket to a maximum height of 140 ft., making a round trip in 45 seconds. Each mixer was operated by a 20-HP. motor.

Cars dumped the sand and gravel into hoppers that fed onto a belt conveyor which delivered to bins. Another belt conveyor delivered the aggregates to the mixers, whence other conveyors delivered the concrete to the hoisting towers. Wagner B W motors of the starterless type were used in all belt conveyors, making it possible to control them all through a bank of switches at one place. In fact one central hoist engineer had complete control of the electric motors in the entire construction plant.

The electrical layout was the joint work of Louis Falzer and Cecil Hodgson, electrical engineers, respectively, of the Thomas Elevator Co. and of the Wetherspoon-Englar Co. The latter company and the Grant Smith Co. were the contractors.

## Link-Belt Roller Chain

Link-Belt roller chains for the transmission of power are described in book No. 358 of the Link-Belt Co., Chicago. They range between malleable "Ewart" Link-Belt and Link-Belt silent chain.

Finished steel bushed roller chains with high grade materials, ideal proportions, and accurate parts, offer a maximum in transmitting value with a minimum in first cost, occupied space, and weight of material. They are particularly advantageous in automotive and special machinery construction, and are superior for general power transmission purposes in most cases to either belts or gears.

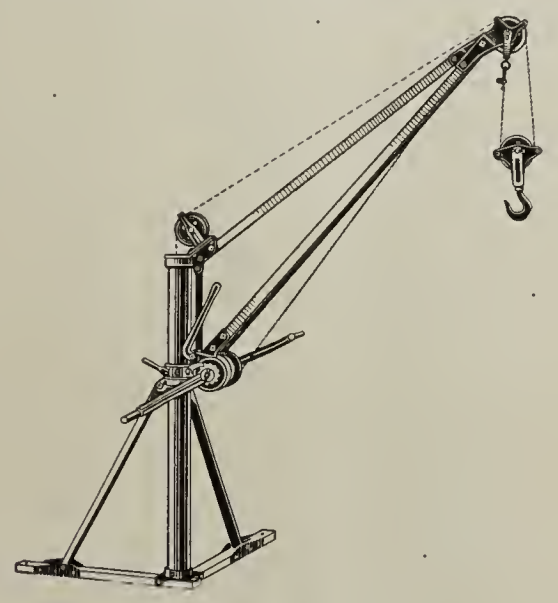
Engineers are almost unanimous in conceding the superiority of the chain drive over other methods of final drive, both for tractors and trucks. Where the travel of the chain in feet per minute is reasonably low, and the stresses do not exceed a reasonable figure allowing for proper factor of safety, this method of drive is sufficiently practical to warrant its more extensive use. With a proper selection of chain size, and careful adherence to a standard make of proven quality, the chain drive will hold its own at any and all points and in all conditions. The public may turn aside for other methods of drive as a result of advertising, but as they become more and more familiar with the problem and service, the chain drive will continue to become more and more popular.

## Builders' Derricks and Winches

Winches and derricks are most important parts of a contractor's equipment. They will often pay for themselves in the time and labor saved in handling material, both light and heavy, on the job.

The winch shown here is especially convenient and practical in construction work. This single drum, single shaft geared winch can be operated both direct and in gear from one shaft. The change from direct to compound can be made in an instant by one small lever. When light loads are being handled, the direct drive can be used with the resulting speed. When heavier loads are being handled, the gear drive should be used.

The other illustration shows the "Champion" all-steel derrick. This is light and portable and at the same time is capable of handling 1,000 pounds. It folds up into two pieces so that it can be readily carried in an auto.



Ready for Work

The Sasgen Derrick Company are the makers of this equipment. Further particulars on their new winch and other types of equipment can be secured from Cement & Engineering News, 672 Transportation Bldg., Chicago, who will gladly send you their catalog giving illustrations and prices.

The Sargen Derrick Folds into Two Pieces for Carrying

## Complains of Cement Rates

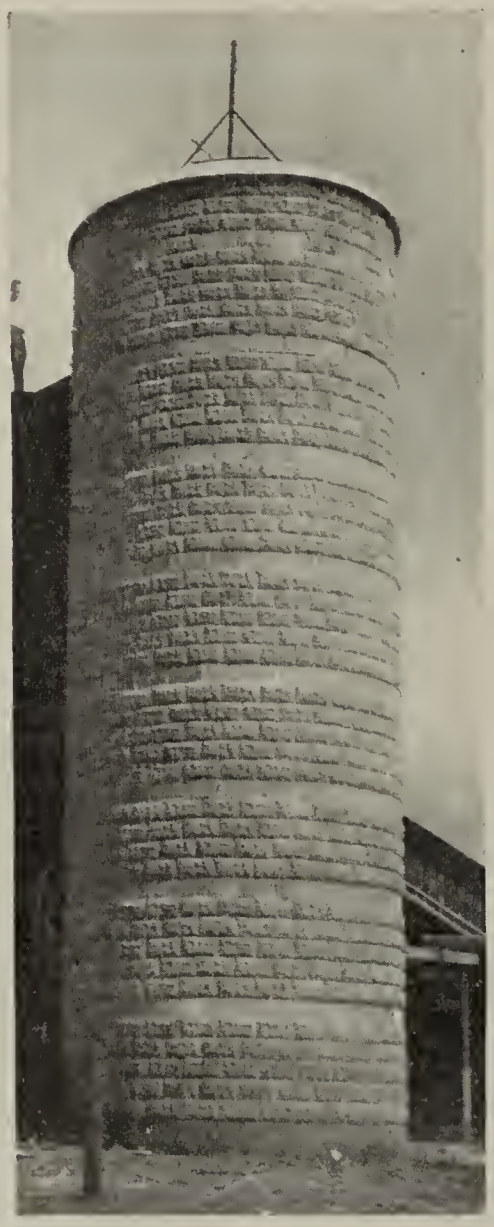
Complaint has been filed with the public service commission, Salem, Oregon, by the Beaver Portland Cement Company, of Gold Hill, Oregon, against the Southern Pacific Company, alleging that the railroad company refuses to establish rates on cement from Gold Hill to stations on its lines within Oregon.

It is also alleged that rates on cement are much higher in this state than on the Southern Pacific lines in California. The complaint further alleges that rates on cement from California cement mills to Oregon points are lower than rates in Oregon.

# A Continuous-Door Concrete Block Silo

"The blocks for the silo illustrated on this page," writes Contractor Fred G. Sprinkle of Logan, Iowa, "were made of a mixture of 1 part cement and 4 parts sand and small pebbles. The inside of the silo was washed after completion with neat cement and water. The silo doors are continuous with concrete cross-ties and concrete jambs. The cross-ties run four feet into block work on each side of jambs. I used door forms and cross-ties and built same in place as I went up.

"From my experience I will state that no lean mixtures should be used in silos and the inside should al-



Concrete Block Silo. A Structure Like This Satisfies Farmers and Is Profitable for Contractors to Build.

ways be painted with cement wash. I find that in washing surfaces with neat cement and water the surface should be well wet and then washed with lean mix—follow up with richer mix—and then finish with as rich a mix as is practicable to apply. I believe this washing is very important.

"On the farm that has this silo there were used about three cars of Atlas Cement in building a concrete block milk house, dairy barn, concrete mangers, floor and foundation, concrete root-cellar, granary floors, sidewalks, and also foundation for house and basement floor."

## President Cement Association

B. F. Affleck was re-elected president of the Portland Cement Association at its annual meeting in New York. Mr. Affleck is president of the Universal Portland Cement Company.

### STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912,

Of Cement & Engineering News, published monthly at 672 Transportation Bldg., Chicago, for April, 1918.

STATE OF ILLINOIS, } ss.
COUNTY OF COOK }

Before me, a Notary in and for the state and county aforesaid, personally appeared John F. Waldron, who, having been duly sworn according to law, deposes and says that he is the Business Manager of the Cement & Engineering News, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, Wm. Seafert, 672 Transportation Bldg., Chicago.
Editor, Wm. Seafert, 672 Transportation Bldg., Chicago.
Managing Editor, Dr. W. Michaelis, 672 Transportation Bldg., Chicago.
Business Manager, J. F. Waldron, 672 Transportation Bldg., Chicago.

2. That the owners are: (Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock.)

Wm. Seafert, Sole Owner, 672 Transportation Bldg., Chicago.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.)

None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

JOHN F. WALDRON,
Business Manager.

Sworn to and subscribed before me this 5th day of April, 1918.

[SEAL.] FRANK W. McVICKER.

(My commission expires 1922.)

Big Profits

Making Vaults

Easy to make, and easy to sell.

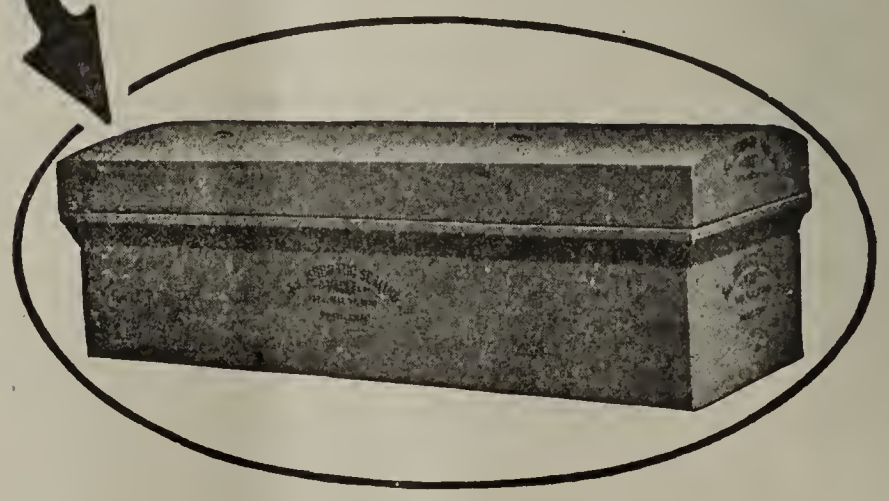
Automatic Sealing Vaults assure big profits and steady work.

You can make these vaults in your spare time, or start a business of your own. The only equipment necessary is a set of our Adjustable Steel Molds.

The Automatic Sealing Vault automatically seals itself when the cover is put on; and protects a burial casket forever against water, vermin, and decay. It is cheap enough for everyone and appeals to everyone.

Write for full information.

The Automatic Sealing Vault Company
216 E. River St. Peru, Indiana



# "NORTHWESTERN"

## TILE AND CULVERT FORMS

In these days of shortage of steel and railroad delays—a word to the wise is sufficient.

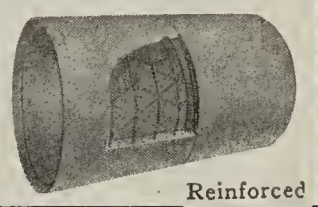
USE CONCRETE.

Besides—greater SAVING—greater SERVICE.

"NORTHWESTERN" Tile and Culvert Forms—Round or Elliptical—Standard and Special Sizes.

Recommended and used by reputable engineers everywhere.

Bulletin No. 29 gives full instructions for making "NORTHWESTERN" concrete tile. Write for it.



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**NORTHWESTERN STEEL & IRON WORKS,**

*"The House of Good Service."* **Eau Claire, Wis.** *Capital* $200,000.00

# JAEGER MIXERS

Everything a batch mixer ought to have is contained in this machine.

Our tilting drum guarantees a perfect speedy mix—single opening, large capacity easy to load and unload and always clean.

The drum is entirely open to view at all times.

The mixer has proven by test to be the most economically operated.

And don't forget you get a mix a minute.

*WRITE TODAY FOR NEW FOLDER OF ENTIRE LINE*

**The Jaeger Machine Co.**

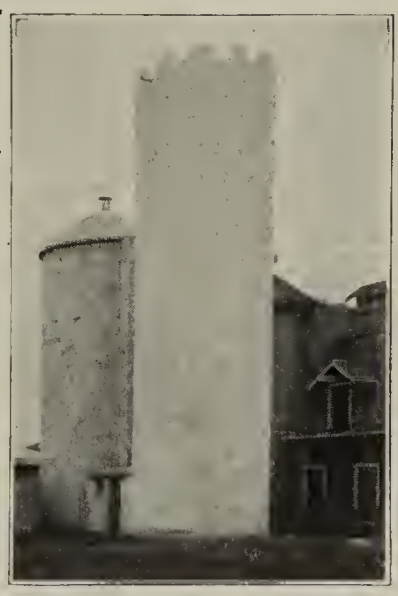
**212 W. Rich St.** **Columbus, Ohio**

SILO CONKLIN EQUIPMENT — CONKLIN CONSTRUCTION COMPANY — HARTFORD MICHIGAN

# CONKLIN CIRCULAR EQUIPMENT

Equipment that gets the business. CONKLIN MOLDS build the job complete from ground to roof, including CONTINUOUS or NON-CONTINUOUS DOORWAY.

CONKLIN EQUIPMENT **builds silos, grain bins, coal pockets, sand and gravel bins, city watertanks, etc.,** at the rate of 8 feet per day with a lower cost than by any other method. No strain on the walls. We have some bargains for you. Don't delay the game any longer. Our prices are right. We sell machines outright.



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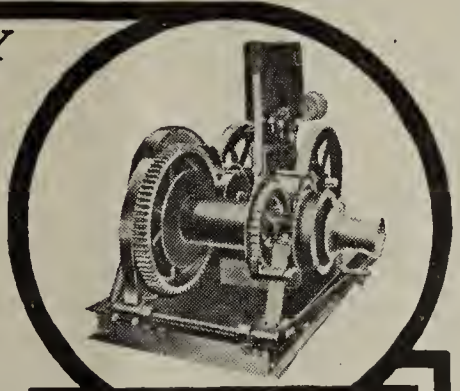
**430 West Main Street** **HARTFORD, MICH.**

**Boss "HEAVY DUTY" Contractors' Hoists**

Gasoline — Kerosene or Electric Power—reliable as steam. Absolutely dependable. $5 to $10 a day cheaper to operate. Three sizes—6, 8, 10 H.P. Three speeds—100, 150, 200 ft. Rope Travel. Hyatt Roller Bearings. Prompt Deliveries. Write, wire or 'phone nearest branch office.



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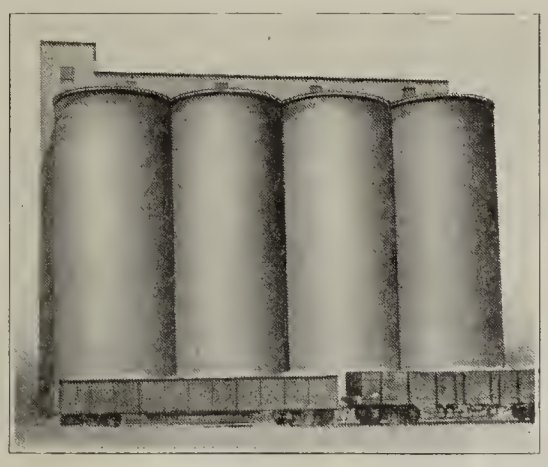
**THE AMERICAN CEMENT MACHINE CO., Inc., Keokuk, Iowa.**

BRANCH OFFICES—New York, N. Y.; Cambridge, Mass.; Richmond, Va.; Pittsburg, Pa.; Cleveland, O.; Indianapolis, Ind.; Louisville, Ky.; Chattanooga, Tenn.; St. Louis, Mo.; New Orleans, La.; Chicago, Ill.; Minneapolis, Minn.; Denver, Colo.; El Paso, Tex.; San Francisco, Calif.; Seattle, Wash.; Spokane, Wash.



**Eleven Bin Stock House**

Erected for the

**Ft. Dodge Portland Cement Co.**

GILMORE CITY, IOWA

Let HOAG Build your Stock House

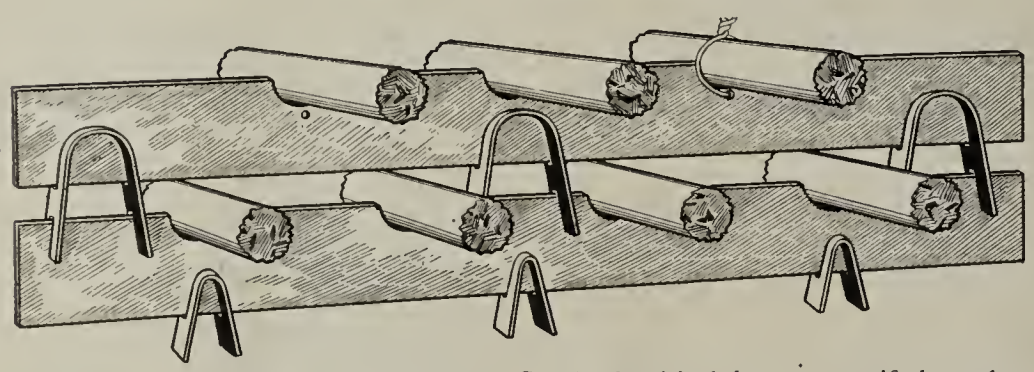
## D. F. HOAG & CO.

**Engineers and Builders**

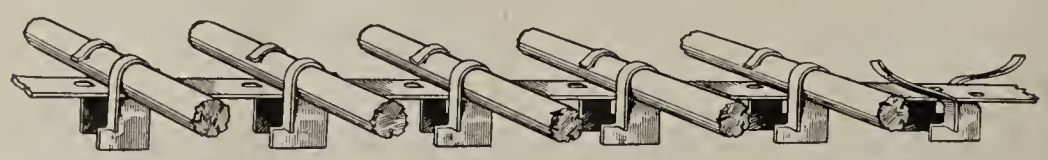
**202-4 Corn Exchange** - - **MINNEAPOLIS**

# UNIVERSAL Concrete Specialties

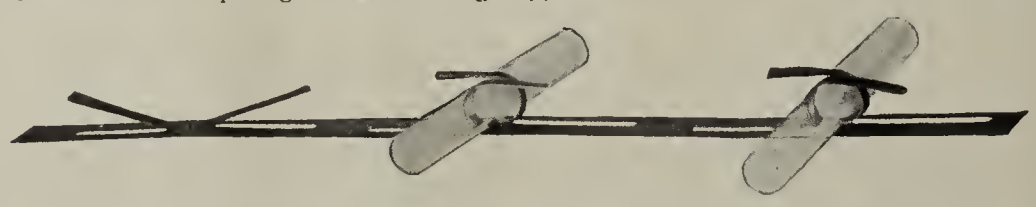
## *for Engineers and Contractors*



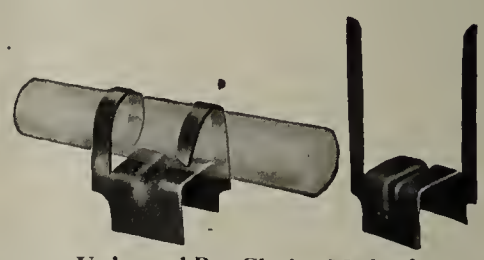
**Universal Beam Saddle.** Made of steel. Can be furnished for any specified number and size of bars, spacing and height.



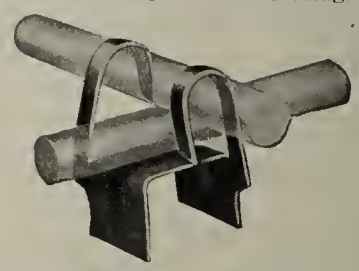
**Universal Slab Spacer.** Made of steel. Can be furnished for any specified length, size of bar and spacing. Standard height ¾ in.



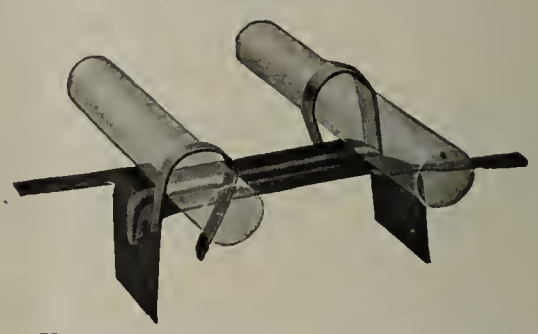
Universal Slab Spacer for second course rods. Laid on top of and at right angles to first course. Furnished for any desired length, spacing or size of rods.



**Universal Bar Chair:** Made of steel. Illustration above shows use with single rod reinforcing.



**Universal Bar Chair.** Same as above. Use for 2-way reinforcing.



**Universal Bar Spacer.** Similar to Universal Bar Chair. Spacing, 4 in., 5 in., or 6 in.

**Universal Form Clamp.** Made to hold rods of any size. Most economical for wall, beam, soffit and column forms. Easily and quickly placed or removed.

**Universal Wire Clamp.** Unmatched for wall form work. No boring of holes or driving of nails required. Great holding power.

**Universal Rod Puller.** A one-man tool. Pulls rods from concrete after it has taken initial set. Indispensable in retaining wall form work.

**Universal Rod Tightener.** One man operates it. Pushes clamp into place and holds it there until screw is set.

## *A Complete Line*

**Send for information on any or all of these time- and money-savers**
**Samples of all of the above sent free. Write today.**

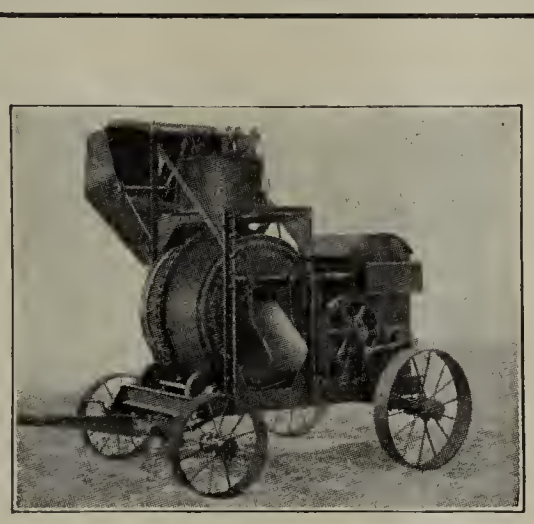
# UNIVERSAL FORM CLAMP CO., 20 N. May St. CHICAGO

# AUSTIN

## *The One Prime Requisite*

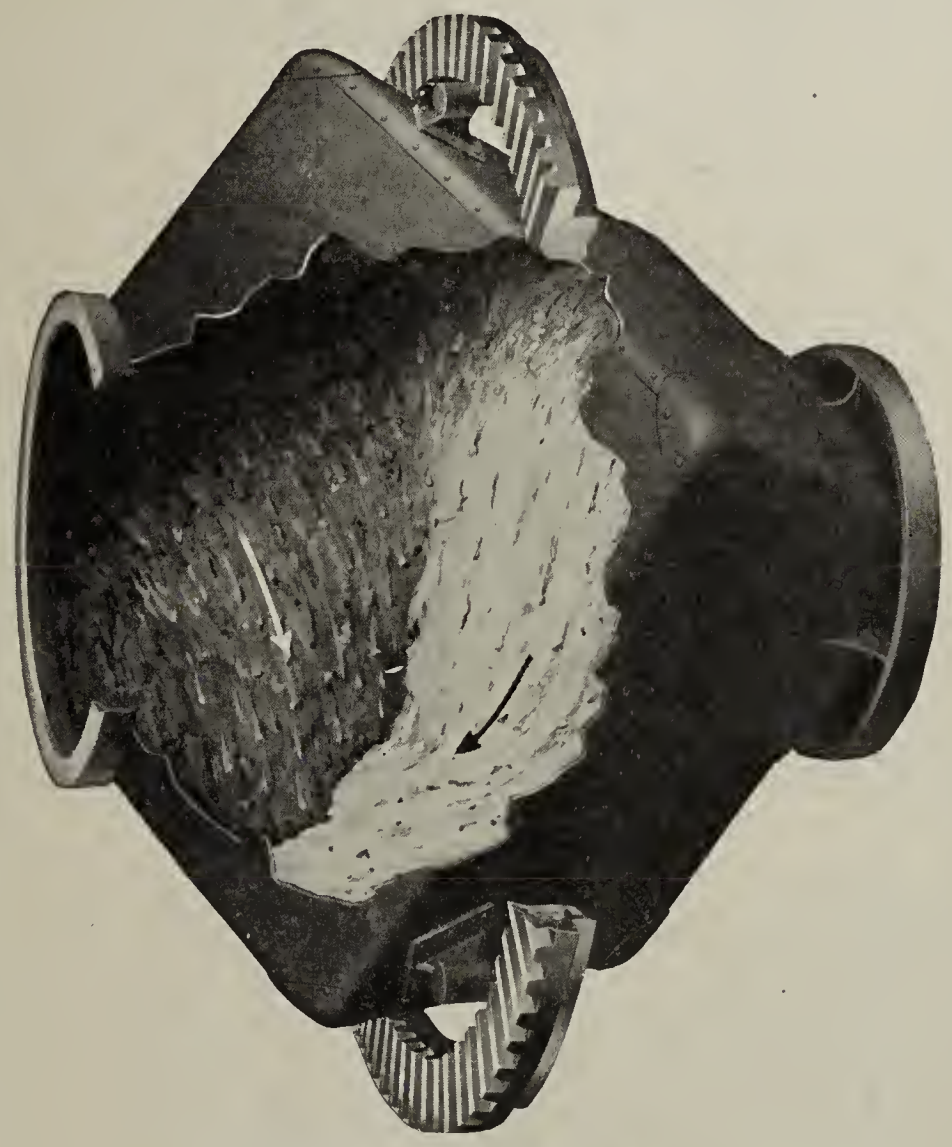
of a Money-Making Concrete Mixer is the ability to Mix Scientifically.

Say all you please about operating speed, efficiency, dependability, etc., the one thing you require of a mixer first, last and all the time is the ability to produce in the shortest time the best possible concrete with the materials and proportions available. That's scientific mixing — and although it costs more to buy, you can't get maximum return without it.



For those who are satisfied with the "blade" type drum the Austin Drum Mixer is a most logical piece of equipment. Nowhere has it found its equal in round drum mixers.

**If a mixer of this type is desired ask for Catalog 21-D**



## AUSTIN CUBE MIXERS

mix by kneading the mass as a unit. Study the cube. Imagine it to revolve. Note the zig-zag travel of the center line and how the alternating angle of each opposite side, as it comes up, folds the upper portion of the mass over upon itself, always toward and past the center.

That's scientific mixing.

That's "Cube" mixing.

That's the greatest money-making feature known in mixer design.

And that's why you could afford to pay for a "Cube" almost double the price of an ordinary drum mixer.

If you want to know more about "Cube" mixing just ask for Catalog No. 21

# F. C. AUSTIN COMPANY, Inc.

***The Products of Municipal Engineering & Contracting Company are now being marketed by us.***

**Main Office, Railway Exchange, Chicago** **New York Office, 30 Church St.**

The
KENT

A Specially Designed

## Mixer for Products Plants

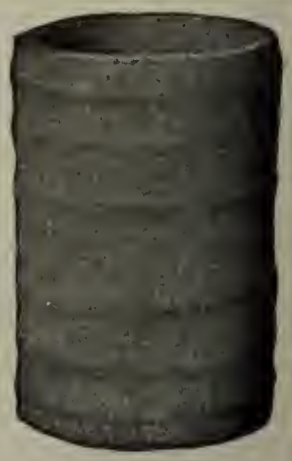
Seventy per cent of the bigger block, tile, brick and specialty concrete products plants of the country use the famous Kent Mixer.

Equipped with automatic feeding device, it makes certain a proper proportioning of aggregates and being continuous in operation, it saves time and labor. The biggest concrete products plant in the world has found that four Kent machines will mix fast enough to keep its many tampers and mold machines busy.

**Write today for descriptive literature and prices.**

## THE KENT MACHINE CO.
Kent, Ohio

## The Biggest Tile Business on Record



Get action now. Big spring buying of drain tile will start soon—and it will be the biggest on record. Cement tile is needed wherever farming is done. Thousands more tile plants are needed to fill the demand.

Equipment must be selected and installed, manufacturing perfected, and a stock of tile made up—all within the next few weeks. Enlist our co-operation.

Dunn equipment is standard. It represents the minimum necessary investment, is sold on a strict guarantee to satisfy, and on 15 days' trial. Ask for the book, "Cement Drain Tile"; we send it free.

## W. E. DUNN MFG. CO.
414 24th Street HOLLAND, MICH.

*"Stonekote" residence at Hinsdale, Ill.*

## "Stonekote" Rough Cast

The only cement plaster for all exterior surfaces—rough cast, float coat, trowel finish, or polish finish. As hard as natural stone; made in ay non-fading color desired. Stonekote is shipped as a dry material; any mechanic can mix and apply. It is the only perfect waterproof and wear-resisting plastic finish to give permanent and delightful results.

*Write for Booklet*

## Garden City Sand Co.
25 North La Salle Street
CHICAGO, ILL.

## POLK SYSTEM

Concrete grain bins, water tanks, coal pockets and silos built by the POLK SYSTEM mean a big, growing business for the contractor. Why waste *your* time at *odd jobs* that *don't pay*. Be fair to yourself. Investigate the POLK SYSTEM. Write

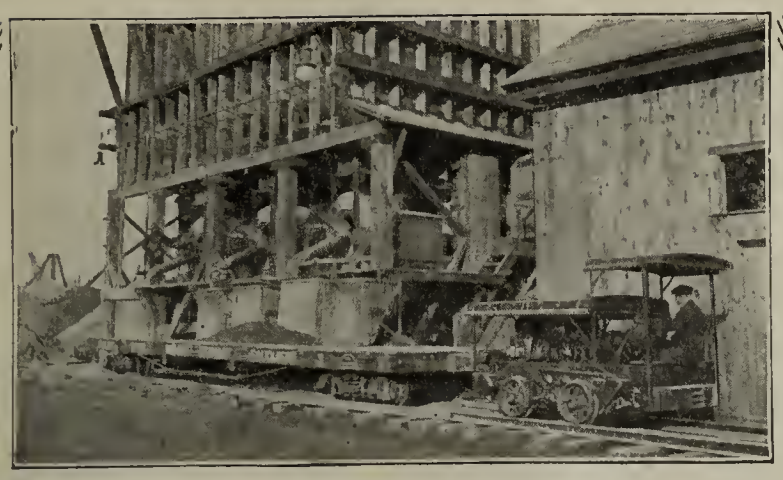
## POLK GENUNG POLK COMPANY
706 Fisher Building CHICAGO

CALDWELL'S
HELICOID

HELICOID Screw Conveyor is heavier, stronger and better made than any other. Requires fewer repairs—no lapped and riveted joints to come apart—flight all one piece. Special hangers, bearings and boxes for cement work. If you have anything to do with the manufacture of cement, you should write for our Catalogue.

Elevating, Conveying and Power Transmitting Machinery.

## H. W. CALDWELL & SON CO.
17th Street and Western Ave., CHICAGO
NEW YORK, Fulton Bldg., Hudson Terminal, 50 Church St.
DALLAS, TEXAS, 711 Main St.



The Plymouth Hauling Concrete for Foley Bros., Welch, Stewart & Fauquier

# "Saves Yard Haulage in Contract Work"

## —Says McArthur

Foley Bros. Welch, Stewart & Fauquier, general contractors, Halifax, N. S., have two Plymouths employed constantly in general yard switching and hauling concrete on the job. C. D. McArthur, chief engineer for this firm, found that—

## The Plymouth
### Friction-Drive Gasoline Locomotive
### Cuts Haulage Costs One Half

It costs less to buy, less to install, less to operate, and less to maintain. It takes heavier loads up-grade, uses full power of motor in high or low speeds, goes at ALL speeds up to 12 miles, and moves quicker without jerk or jar.

*MR. McARTHUR PROVES ALL THIS*

"The Plymouth Locomotives are entirely satisfactory to us," he says. "We find them of great help in our yard work and we find it would be hard work to get along without them."

**THIS BOOK TELLS**

We have a book that tells the complete story of these contractors as well as other owners of Plymouths. It is also full of cost data and valuable information regarding haulage problems similar to your own. A copy for the asking—send for it today.

**THE J.D. FATE CO., 220 Riggs Ave., PLYMOUTH, OHIO**

# IMMEDIATE DELIVERY

"Franklin"

ROUND—SQUARE—FLAT—SQUARE TWISTED

## STEEL BARS
### for CONCRETE REINFORCEING

We can meet your Reinforcing Steel Requirements. This means not only quick shipment from the mills but co-operative service for rapid transportation. If you want to know just what your exact cost will be, send us the Blue Prints and we will give you a lump sum bid on all the steel sheared to lengths, bent to specifications and delivered to the job,

*Our Engineering Department is at your service.*

## The FRANKLIN STEEL WORKS
### FRANKLIN, PENNA.

Cleveland, 1320 Rockefeller Bldg.
Boston, - - 12 Pearl Street
Philadelphia. 2215 Race Street
New York, - 30 Church Street
Chicago, - - 332 So. Michigan Blvd.
Buffallo, - Erie County Bank Bldg.
Pittsburgh, Oliver Bldg.

QUALITY SERVICE

# The Waterloo Bar Bender will pay for itself on the first job

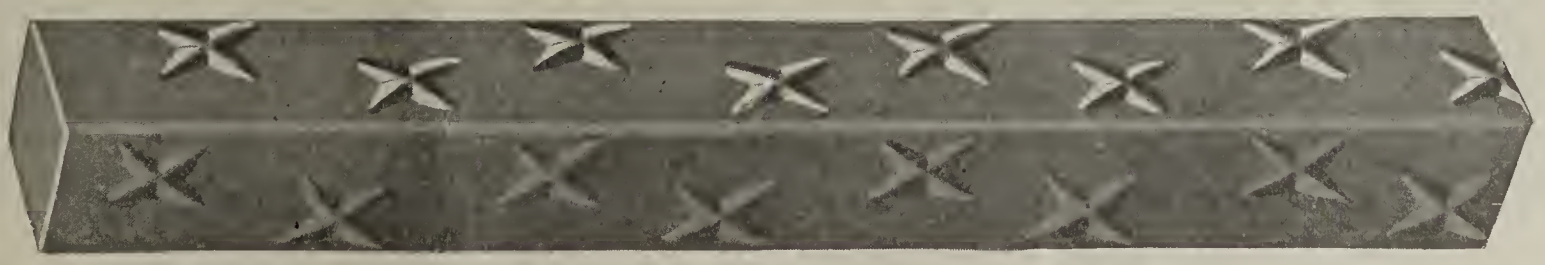
No. 2 Machine Bends to including 1⅛" Bars, weighs 110 lbs. Price.....$20.00
No. 3 Machine Bends to including 1½" Bars, weighs 210 lbs. Price..... 25.00
Machine Stand weighs 90 lbs. Price..... 10.00

The price of this bender is returned to you in time and money saved on your first job, and the machine itself is indestructible, so you multiply this saving year by year.

Makes bends at various angles to meet any design. Bending posts of turned steel. The post that revolves through the slot in the plate is equipped with loose steel roller to keep bar from creeping during bending. Machine is furnished with detachable handle 7 ft. long. No. 2 machine is especially adapted for field work.

**Waterloo Construction Co., Waterloo, Iowa**

# Inland Deformed Bars



In Open Hearth Steel (New Billet Stock), Hard Grade, and Rail Carbon Steel (Rerolled).

The mechanical bond is theoretically correct and is guaranteed by us, having been designed by expert concrete engineers and approved generally by engineers and architects.

The corners are rounded to prevent splitting of the concrete. Bending, fabricating and setting are easily done with these bars. Sizes ⅜ to 1¼ inch. Lengths up to 85 feet.

Prompt shipments during 1918.

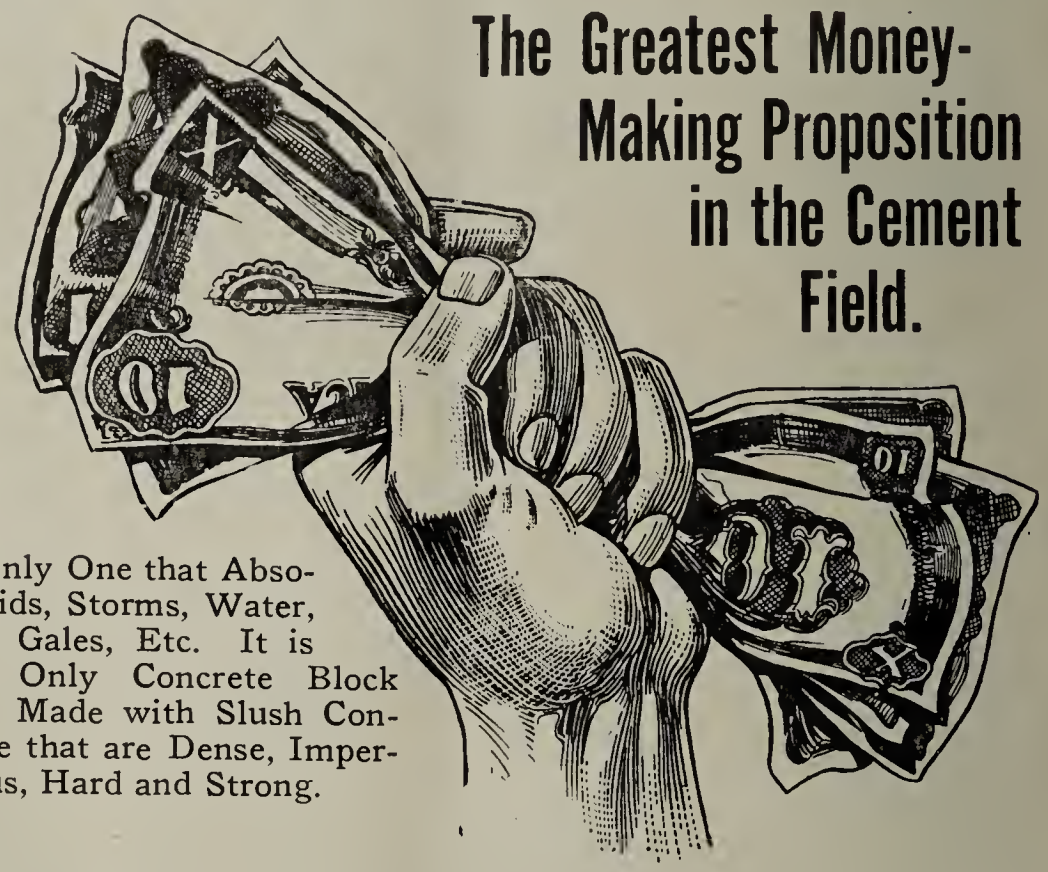
**INLAND STEEL COMPANY First National Bank Bldg., CHICAGO**

# YOU CAN MAKE BIGGER PROFITS

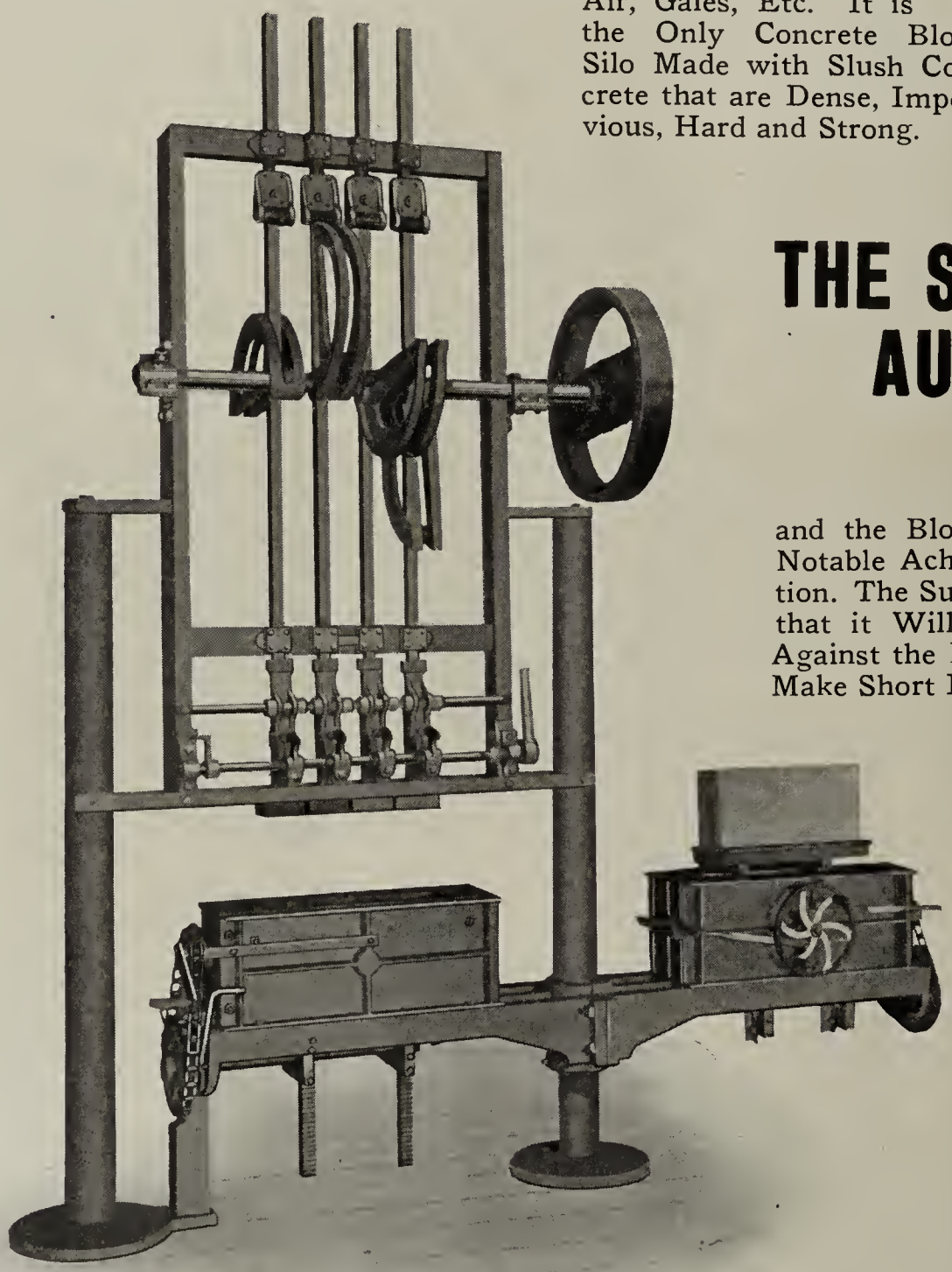
AN OPPORTUNITY FOR
CONCRETE WORKERS AND
PROGRESSIVE BUSINESS MEN.

## At Last! The Perfect Silo

The Greatest Triumph in Silo Construction. The Supreme Result of Many Years Untiring Effort and Exhaustive Investigation Brought to Perfection After Long Scientific Analysis of Ensilage and Studying the Short Comings of All Other Silos. Now the Superior Concrete Block Silo is the Only Practical Silo that Every Agricultural Expert Will Unhesitatingly Indorse. It is the Only One that Absolutely Defies the Destructive Elements of Acids, Storms, Water, Air, Gales, Etc. It is the Only Concrete Block Silo Made with Slush Concrete that are Dense, Impervious, Hard and Strong.



## The Greatest Money-Making Proposition in the Cement Field.



## THE SUPERIOR AUTOMATIC SILO BLOCK MACHINE

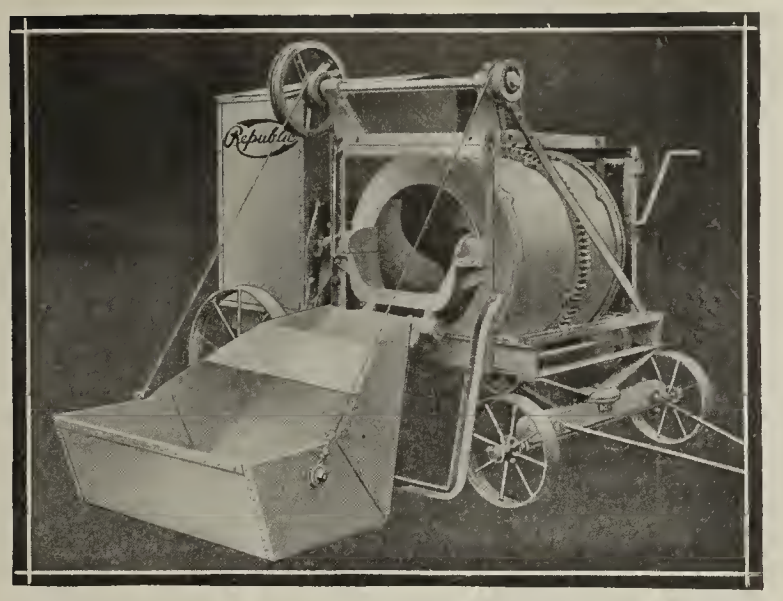
and the Blocks Produced Therefrom is the Most Notable Achievement in Silo Design and Construction. The Superior Silo is so Thoroughly Reinforced that it Will Stand Like a Sphinx in the Desert Against the Fierce Attacks of Acids and Gales that Make Short Life of so Many Other Silos. We Have the Greatest Money-Making Proposition for the Wide-Awake Contractor. Three Men Can Make Enough Blocks for a 12x30 Silo in One Day. We Also Manufacture the Miller Silo Steel Door Frame. We Supply Moulds and Pallets to Manufacturers of Our Cement Block. The Superior Machine is in Fact a Double Block Automatic Tamping Machine Which Makes Great Speed in the Making of Cement Block Silos. The Block is Far Superior to the Stave. This is the Best Proposition on the Market and it is Worthy of the Consideration of All Progressive Concrete Men. Here is Where You Can Make Bigger Profits. Machines Leased, Not Sold. Write for Particulars Today.

## Superior Concrete Machine Co.

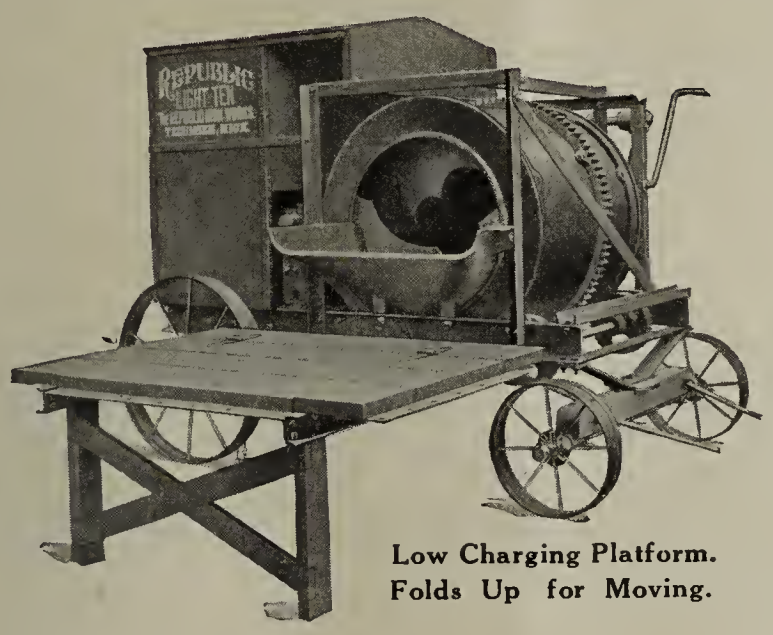
**NORTH JUDSON, IND.**

Republic

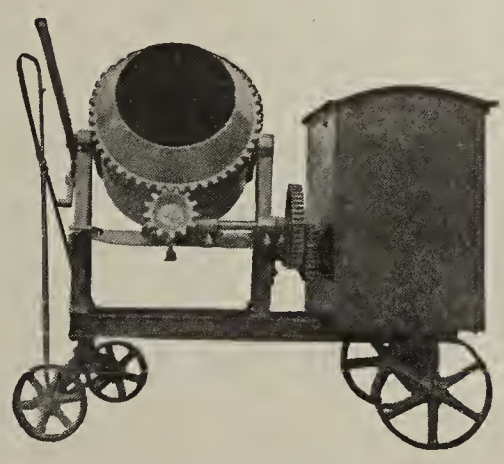
# Low Charger or Power Loader



Low Charging, Light Weight, Sack Size. A good, well made 10 ft. mixer.



Low Charging Platform. Folds Up for Moving.



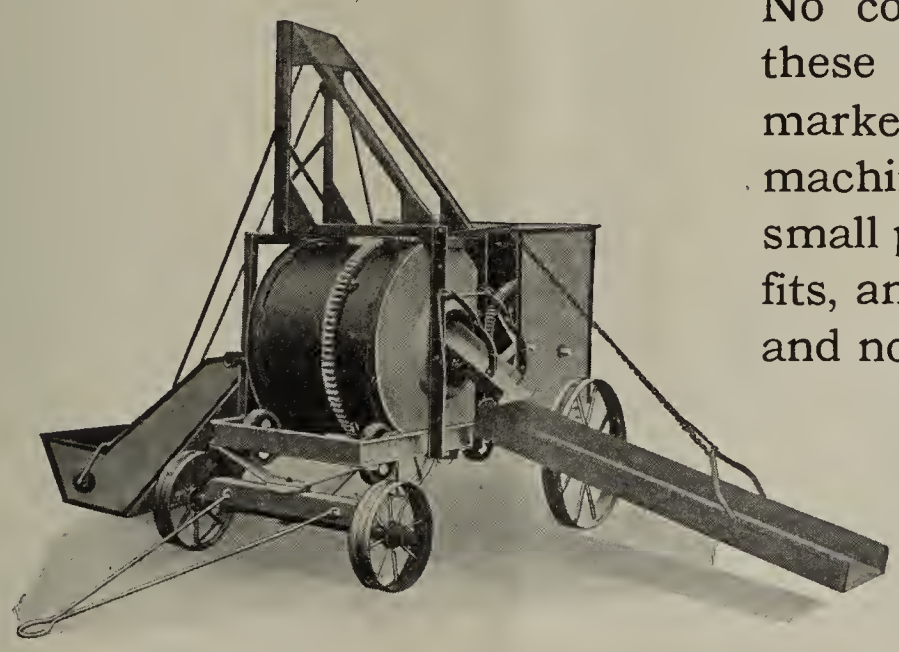
*Republic "3"*
America's Greatest Small Mixer

Well built and exceptionally low in price.

## PRICE, $55 AND UP

New 1918 Catalogs Ready for Distribution—

Showing the latest and most improved machines built.



No contractor can afford to be without these catalogs who expects to be in the market for a concrete or mortar mixing machine. Hand or belt power mixers, small portable machines, medium size outfits, and full sack size mixers in both tilting and non-tilting types. Prices from $55 up.

***Write for Catalogs Today***

Terms to Suit the Buyer

# Republic Iron Works

**Box 454** **TECUMSEH, MICH.**

## WOULD YOU USE AN INTERMEDIATE SYSTEM FOR CONVEYING YOUR FINISHED GRAVEL FROM PLANT TO CAR IF YOU COULD SPOT THE CAR UNDER THE SPOUTS OF THE BIN?

Not If You Could Help It Would You?

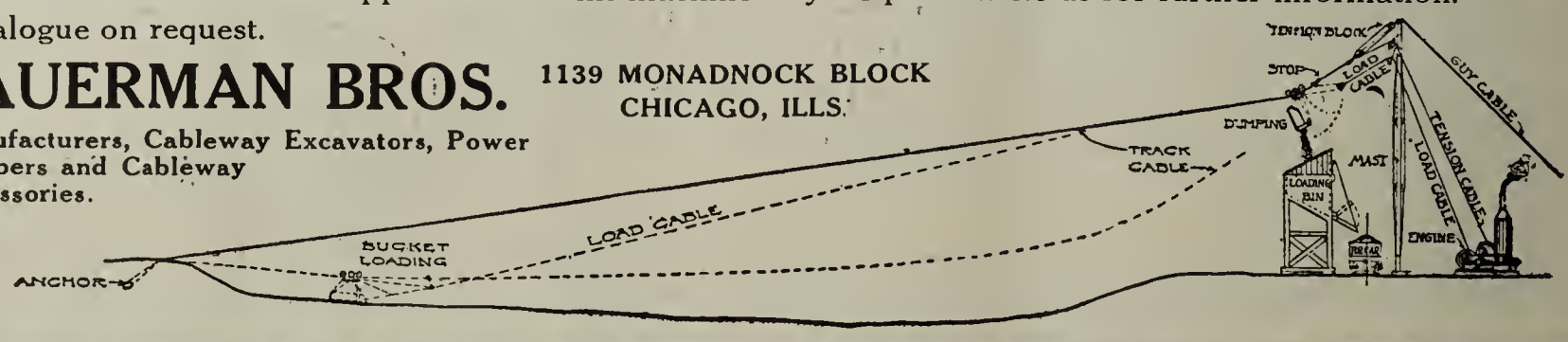
Then is it not just as logical to do away with an intermediate conveying system between **pit** and plant?

Are you using one machine for digging the material and another to convey it to the plant when you could just as well use one machine for the combined operation, saving the additional labor, machinery and upkeep cost?

The Sauerman Dragline Cableway Excavator is digger, conveyor and elevator combined in one.
It is the direct method from pit to plant.
It digs, conveys, elevates and dumps in one continuous forward operation.
Operated by a double drum friction hoist under one man control.
One Machine—One Operation—One Man Control
If you are interested in the application of this machine to your plant write us for further information.
Catalogue on request.

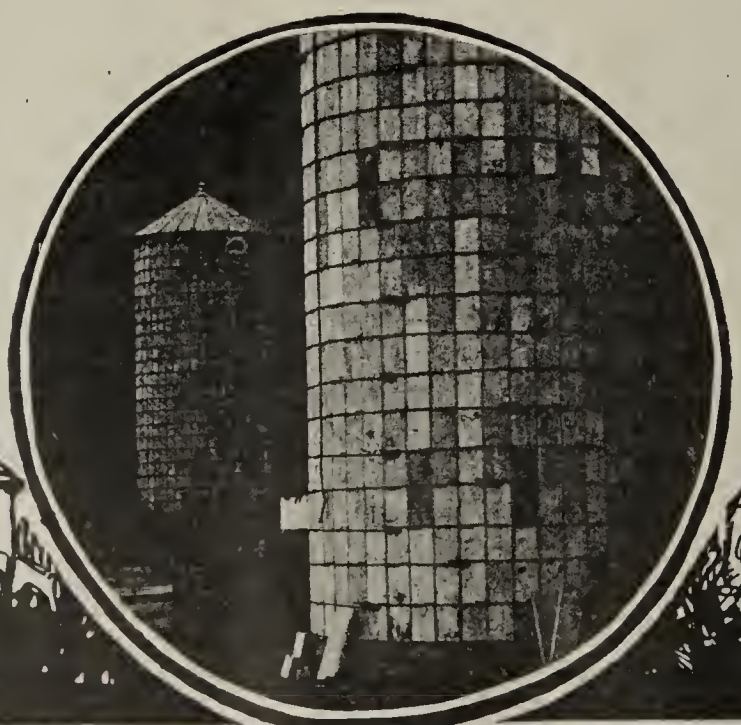
**SAUERMAN BROS.** 1139 MONADNOCK BLOCK CHICAGO, ILLS.

**Manufacturers, Cableway Excavators, Power Scrapers and Cableway Accessories.**




# The Silo Business will come to you ---- if you build CALDWELL SILOS

CALDWELL Silos practically sell themselves. They are storm-proof, water-proof, air-proof, acid-proof, fire-proof, vermin-proof — altogether, trouble-proof. Each stave is a wet mixed reinforced stave having $\frac{3}{8}$" bar of twisted steel placed diagonally in the concrete. And each stave interlocks with the six adjoining staves; is crossed and held in place by three external bands. Caldwell Silos are permanent, moderate priced and favorites with the farmers.



We have the most business-like silo proposition on the market for the man who will push these silos in your community. There is no territory to buy, no royalty to pay. We will start our representative "right." If you are interested in securing this business, write for full information NOW. Don't delay and let a neighbor get your territory.

**CO-OPERATIVE CONCRETE CONSTRUCTION COMPANY**
**OSKALOOSA IOWA**

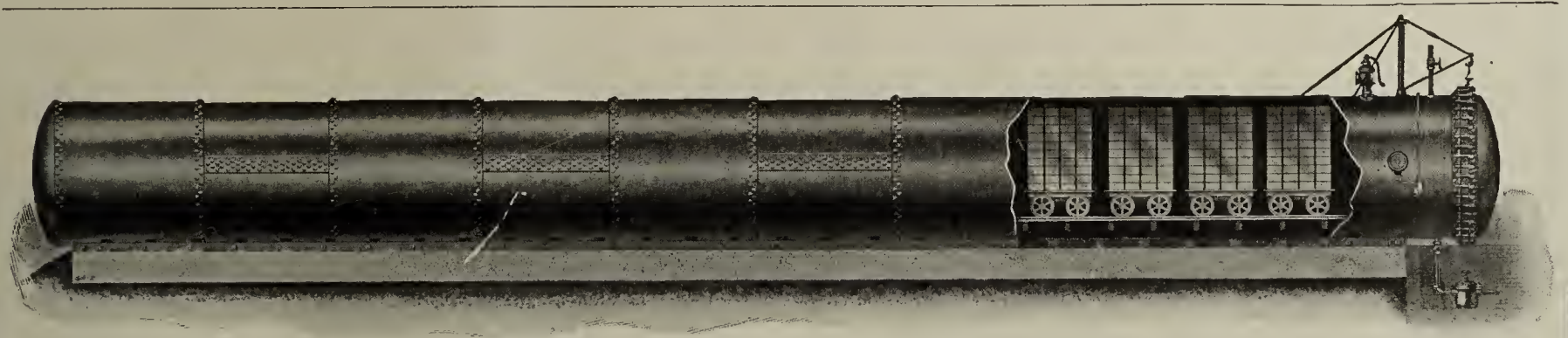
# Sand Lime Brick Machinery

Our complete line of Sand Lime Brick Machinery makes it possible to secure just that machinery which is required to make your plant a success. We favor no particular type of machinery but are guided by the needs of the customer. Our wet and dry grinding mills have transformed a number of unsuccessful plants into dividend producers, while our Presses, Mixers, Hardening Cylinders and other equipment are of equal quality. We can exactly meet the demands of any manufacturer with a quality of machinery which will operate at a profit with a minimum amount of attention and expense.

*Correspondence solicited*

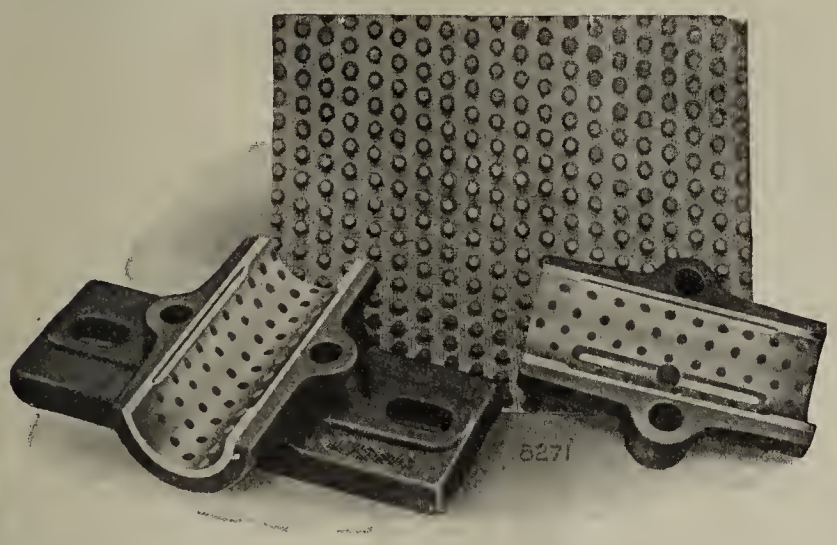
## The American Clay Machinery Co.

**WILLOUGHBY, OHIO**



# Eliminate Friction—Reduce Labor of Rebabbitting

**PREPARE YOURSELVES NOW** against the serious problems of labor and coal shortage. You must utilize all improved mechanical and lubricating devices as will increase your present production to the fullest extent.




## RANDALL GRAPHITE SHEET LUBRICATOR

**Will increase the life of your Bearing 300 to 400 per cent**

It will enable your bearings to stand up under heavy pressure and high speed without heating, assuring an appreciable increase in operating efficiency with a substantial saving in operating cost. In addition to the economies of oil, babbitt metal, time and labor, the slight amount of oil required for bearings so equipped overcomes all oil soaking in the belt, and the saturating of the machinery with oil is also avoided. This simple device will displace sufficient bearing metal to pay for the cost of the lubricator.

***Write for circular, information and trial order plan***

## Randall Graphite Lubricator Co.

**816 W. LAKE ST., CHICAGO**

# Cut Gears

Spur,
Spiral,
Bevel and Worm
Steel and Rawhide

*Accuracy and Prompt Delivery*

When you want a gear cut you want it **quickly,**—we emphasize our promptness without sacrificing accuracy.

## Ganschow Cut Gears

stand first in accuracy—perfect mesh—silent operation and the quality that counts for long service.

*Estimates furnished from drawings and specifications.*
*WRITE FOR CATALOG.*

**WILLIAM GANSCHOW CO.**
1003 W. Washington St. - CHICAGO

# Everything in CUT GEARS

We have the largest and most modern equipped gear making plant in the west. Our gear making machinery embraces everything known that will in any way facilitate the manufacture of high-grade cut gears of all kinds up to 15 feet in diameter.

**Quick Deliveries, Low Prices and First Class Work Our Motto**

## Foote Bros. Gear & M. Co.

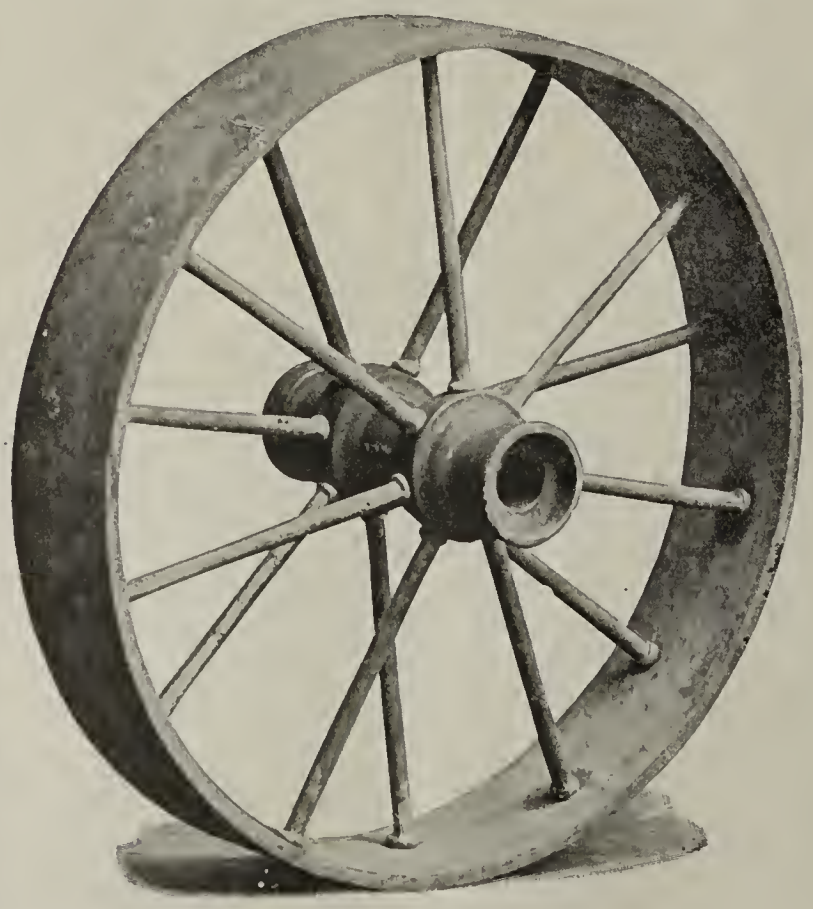
**210 to 220 N. Carpenter St., Chicago**

# FRENCH & HECHT

**Davenport, Iowa** **Springfield, Ohio**

**Metal Wheels in quantity for Manufacturers only**

***Combined capacity 8,000 tons per month***



## Centrally Located

**Near All the Famous Shops and Theatres**

# HOTEL EMPIRE

**Broadway at 63rd Street**
**NEW YORK CITY**

Room, use of bath **$1.00** Room with bath **$1.50**
Parlor, bedroom and bath, one or two persons **$2.50**

Add to the above rates, 50c for each additional person.
All surface cars and Fifth Ave. Busses pass the door.
Subway and "L" stations—two minutes.
Beautiful Central Park—1 block.
OUR RESTAURANT is noted for its excellent food and moderate prices.

**P. V. LAND,** - **Manager**

# BLACK GIANT STITCHED DOUBLE BELTING

THIRTY thousand feet of BLACK GIANT DOUBLE STITCHED BELTING in sizes ten to twenty-four inch eight ply furnished within the last sixty days to two of the largest cement plants in the United States. Both of these plants have used BLACK GIANT DOUBLE STITCHED BELTING for the past five years. BLACK GIANT DOUBLE STITCHED BELTING is the most improved cotton belting manufactured today and is adapted for all kinds of work wherever machinery is run, either for transmission of power, elevators or conveyors.

*Manufactured exclusively by*

**McIlroy Belting and Hose Co.**

**Hammond, Indiana, U. S. A.**

**BELTING**

"V-B" Balata
"AMPERE" (Canvas Stitched)
"WHITE SEAL"

Write for Prices, Discounts and Samples

**VICTOR BALATA & TEXTILE BELTING CO.**

Factory: Easton, Pa. Main Office: 38 Murray St., New York
Stores: 167 N. Market St., Chicago, and 87 High St., Boston

**CONVEYOR BELTS A SPECIALTY**

# The Aero Pulverized Coal System

is a **Unit System.** The Pulverizer and the furnace is the unit. There is nothing between them but a plain iron pipe. Coal drying is optional.

The AERO is a no-storage system and therefore free from fire and explosion hazards.

The pulverizing, mixing and feeding operation, as well as the furnace, are at one time under the eye of one man. Write for Bulletin.

**AERO PULVERIZER CO., 120 Broadway, NEW YORK**

# THE FULLER ENGINEERING COMPANY

**Designing, Constructing and Operating Engineers**

**Cement and Hydrated Lime Plants a Specialty**

**Reports, Examinations and Analyses of Raw Materials for Cement Consultations Solicited**

**Offices: Allentown National Bank Bldg.**
**ALLENTOWN, PA.**

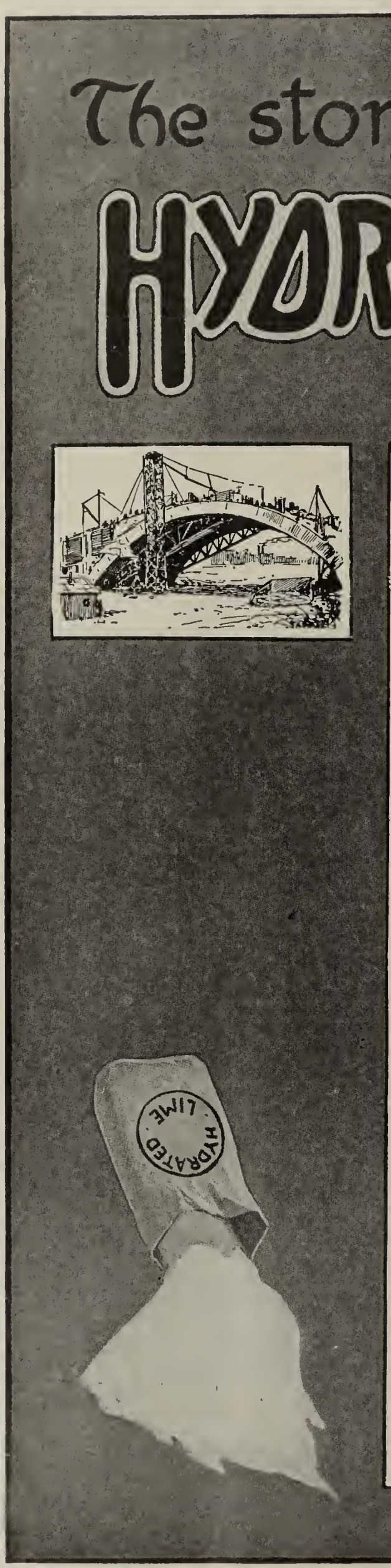
# WATER SOFTENING OR FILTRATION

FOR BOILER FEED AND ALL INDUSTRIAL USES

WM. B. SCAIFE & SONS CO. PITTSBURGH, PA.

# The story of HYDRATED LIME






## SHOOTING CONCRETE 4,000 FEET

Out at San Francisco the Twin Peaks Tunnel is being built by R. C. Storrie & Co. It passes through water bearing soil and City Engineer M. M. O'Shaughnessy specified Hydrated Lime in the concrete to make the structure waterproof, eight pounds of hydrate being used to one hundred pounds of cement; the concrete proportions being 1 cement, 2¼ sand and 5 crushed gravel, graded from ¼ to 1¼ inches.

R. C. Hackley, engineer for the contractor, writes:

"On this work the pneumatic concrete placing system is used and we have shot the concrete twenty-six hundred feet through eight-inch pipe and expect to extend this line to four thousand feet or more; the lime being a great help as a lubricant. Where chutes are used they can be much flatter and will carry the concrete much farther with lime in the mix; in fact we have used lime for this purpose and for easier placing in narrow walls and around reinforcement, even when not specified, on account of the labor saved.

"The uniformity of the concrete on this piece of work and the absence of honeycomb patches can be greatly attributed to the use of Hydrated Lime."

*Write any of the following competing manufacturers of Hydrated Lime for complete information about Hydrated Lime in Concrete.*

**Marblehead Lime Co.,**
Chicago—Kansas City

**Port Byron Lime Assn.,**
Port Byron, Ill.

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**Riverton Lime Co.,**
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THE STATE OF DELAWARE
STATE HIGHWAY DEPARTMENT

ADVERTISEMENT FOR BIDS

Sealed proposals will be received by the State Highway Department, at its offices, in Dover, Delaware, until two (2) o'clock P. M., April 15th, 1918, and at that place and time publicly opened and tabulated, for the construction of the State Highways in the State of Delaware, involving the following contracts:

CONTRACT No. 1: Kent County
4.05 miles cement concrete roadway.

CONTRACT No. 2: Kent County
4.90 miles cement concrete roadway.

CONTRACT No. 3: New Castle County
2.46 miles vitrified brick roadway with concrete foundation.

CONTRACT No. 4: New Castle County
3.75 miles vitrified brick roadway with concrete foundation.

CONTRACT No. 5: Sussex County
6.06 miles cement concrete roadway.

CONTRACT No. 6: Sussex County
4.90 miles cement concrete roadway.

CONTRACT No. 7: Sussex County
6.61 miles cement concrete roadway.

CONTRACT No. 8: Sussex County
6.36 miles cement concrete roadway.

Performance of contract shall commence within ten (10) days after execution of the contract and be completed on or before December 31, 1918.

Monthly payments will be made for (90) ninety per cent of the work completed each month.

Bidders must submit proposals upon forms provided by the Department.

Each proposal must be accompanied by a surety bond, certified check, or money to the amount of ten (10) per centum of the amount of the proposal.

The envelope of the proposal must be marked:
"Proposal for the Construction of a State Highway under Contract No—."

The contract will be awarded or rejected within twenty (20) days from the date of opening proposals.

The right is reserved to reject any or all bids.

Plans and specifications can be obtained from the department at Dover, Delaware, by depositing ($10) ten dollars, which will be refunded when the plans and specifications are returned in good condition.

Plans may be seen, and specifications and detailed information obtained from

CHAS. M. UPHAM, Chief Engineer,
State Highway Department,
at Dover, Delaware.


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**All sizes, all makes bought and sold**

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All equipment good working condition. Right prices. Prompt delivery.

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Marion Model No. 20 with 1¼ yard Dipper as good as new.

*Can Make Immediate Shipment*

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1—Marion Steam Shovel, Model "G."
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1—No. 2 Gates Gyratory Crusher.
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2—Standard 70-ton Bucyrus, shop numbers 733 and 572, 2½-yd. dipper.
2—45-C Bucyrus, shop numbers 1297, 1202; 1½-yd. dippers.
1—Model 60 Marion, shop number 1685.
1—85-C Bucyrus, shop number 1649, 4-yd. dipper.

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1—Model 220 Marion, all steel drag-line, shop number 2839, mounted on 4 equalizing 4-wheeled trucks; equipped with 60 to 90 ft. boom and 2-yd. Page bucket.
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100—3-yd. and 4-yd., 36-in. gage Western cars.
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1—No. 0 Thew shovel, ⅝-yd. dipper, shop number 894.

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3—Standard gauge Vulcan saddle tank locomotive, 11x16 in. cylinder, weight 21 tons, automatic coupler, steel cabs, steam brakes, 165 lb. steam pressure. Built new in 1912 and 1913.
1—Standard gage Porter saddle tank locomotive, 10x16 in. cylinder, weight 20 tons, shop number 3492.
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**LOCOMOTIVES—Con.**

2—16x22 4-wheel switchers, C., M. & St. P., J-2 class, weight 32 tons.
1—18x26, 8-wheel passenger type locomotive, Schenectady build; total weight 51 tons; weight on drivers 33 tons.
5—36-in. gage, 10x16 and 9x14 Davenport saddle tank locomotives.
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Compressor with reservoir, weight 15,000 lbs.
75 lb. rail, complete with target switch-stands, frogs, points, etc.
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32—30-in. Griffin Pulverizing Mills.
10—Allis-Chalmers Rotary Kilns, 7 ft. to 5 ft. 6 in. x 60 ft., complete with Automatic Kiln Feeder Boilers, coal pulverizing equipment, etc.

Besides the above, the plant is equipped with all the necessary conveyors for material, elevators, all copper wire for transmitting current, laboratory complete, office buildings, stone quarry, shale quarry, sidings, workmen buildings and approximately 325 acres of Real Estate.

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1—Leyner-Ingersoll **Drill Sharpener** complete with dies, dollies, gauge, etc.
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1—Horizontal Tubular **Economic Boiler,** 125 H.P.
1—General Electric Company **Generator,** 9½ Kw.
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1—BCR **Jackhammer**
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Carload French or Danish Flint Pebbles for prompt delivery. Would prefer shipment in sacks but can use in bulk. Quote price per ton, giving size of pebbles, grade, etc. Address Southern Cement Company, Birmingham, Ala.

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One No. 4 style "K" Allis Chalmers gyratory crusher, complete, almost new, but very little wear. Can be had at once. Address Chas. A. Freiberg, Austin Bldg., Buffalo, N. Y.

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1—10-ton American, 4-wheel, 38-ft. boom, bucket operating drums.
1—10-ton Industrial, 4-wheel, 34-ft. boom, bucket operating drums.
1—10-ton Orton and Steinbrenner, 8-wheel, M. C. B. 40-ft. boom, bucket drums.

### LOCOMOTIVES

2—Baldwin, standard gauge, **saddle tanks;** one 33-ton, the other 35-ton; cylinders of both 14x24; four driver type; Hunt's inspection certificate of approval furnished.
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Ingersoll-Rand duplex, two-stage steam driven, capacity, 1,190 ft. air at 110 lbs. pressure.

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1—2 -yd. Hayward
4—1½-yd. clam-shells, various makes
1—1 -yd. orange-peel bucket
1—1 -yd. Page Dragline bucket
1—2 -yd. Page Dragline bucket
1— ¾-yd. Slack-line outfit complete

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20— 4 -yd. Western 36-in. gauge cars
20— 1½-yd. Western 24-in. gauge cars
30—12 -yd. Western standard-gauge cars
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20—60,000 capacity gondolas

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1—Ingersoll-Rand Imperial type X-B-2, capacity 2400 ft., belt-driven
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1—14 x 12 Laidlaw-Dunn-Gordon belted
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W. E. Dunn Mfg. Co.
Ideal Concrete Machinery Co.
Northwestern Steel & Iron Works.

### Pipe for Potash Plants
Robertson Bros. Mfg. Co.

### Powder
Atlas Powder Co.
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Franklin Steel Works.
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### Silo Forms (Monolithic)
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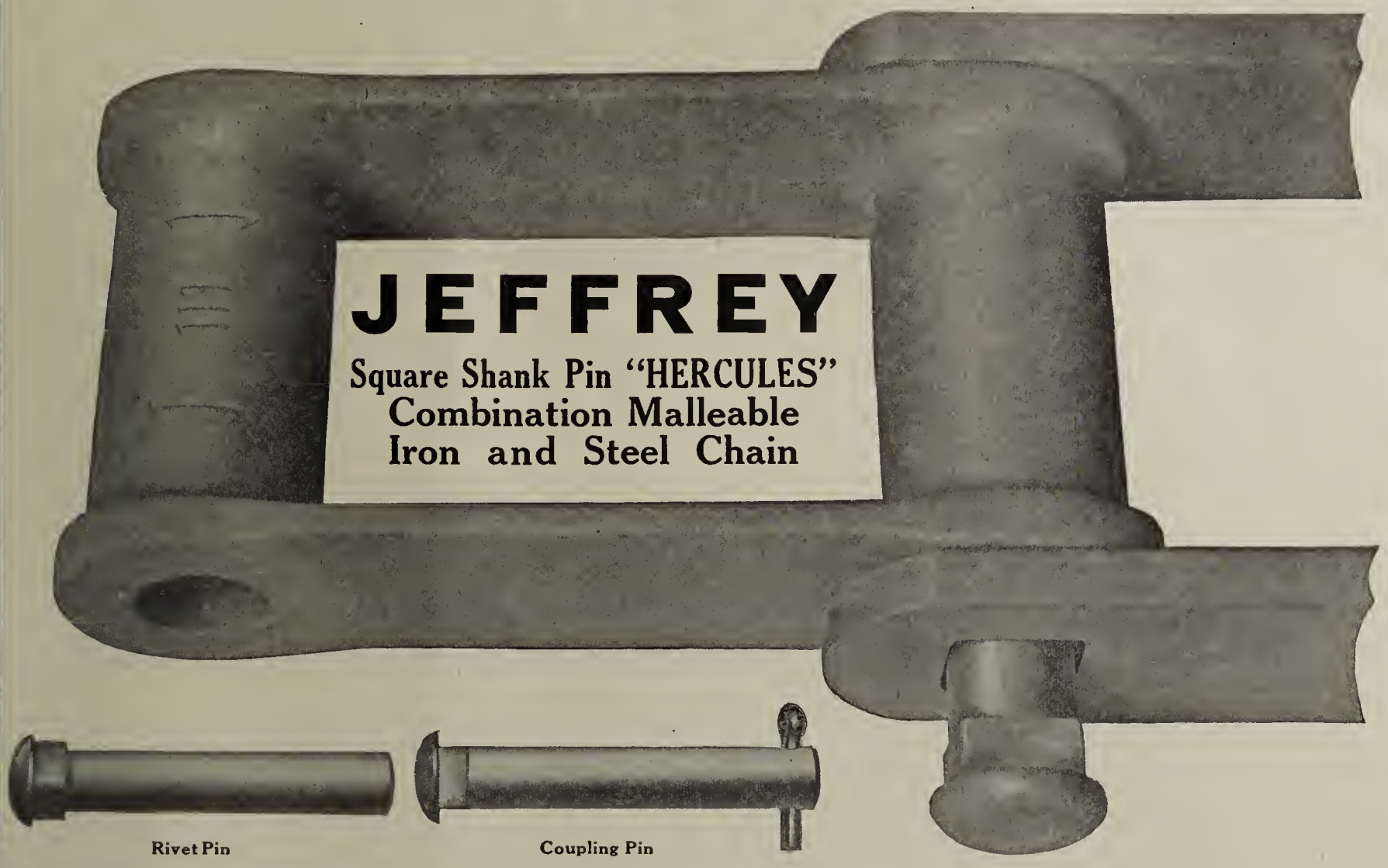


# Here Are Some Advantages of the Jeffrey Square Shank Pin Construction

The hard, smooth steel pins with the SQUARE SHANKS fit into perfectly SQUARE HOLES. The bearing surface is the FULL WIDTH of the pin. There is no rocking motion in the side bar.

The solid cast link is made of high-grade malleable iron, both for strength and durability. The long barrel provides extra wearing surface on the pin and the sprocket wheel.

Steel Side Bars are of high carbon steel —and interchangeable.

The Square Shank Pins are made as Rivet or Coupling Pins.

Jeffrey Square Shank "Hercules" Chain is a most economical and substantial chain for service in handling gritty materials and for heavy duty Elevators and Conveyers.

Hercules Chains may be used over standard detachable chain sprocket wheels as follows:

| | | | |
|---|---|---|---|
| 102-B | on 95-J | 132 | on 122 |
| 111 | on 108 | 188 | on 88 |
| 131 | on 103 | | |

**We are originators of this type of chain and have been building and improving it for 25 years**
**Write for our Chain Catalog No. 211-O**

## The Jeffrey Manufacturing Company

**914 North Fourth Street, Columbus, Ohio**

# DID YOU EVER TRY IT?

When you have a concrete job right in town, where you have very little room outside the building for storing and handling long reinforcing bars, do you realize that

## Automobile Delivery Floor By Floor

just when you want it, unloaded right where you use it, will save you a lot of time, trouble and expense!

## This Is the Kind of Service We Offer You

HAVERMEYER BARS

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CHAIRS

CHICAGO FLEET
Concrete Steel Company

HAVERMEYER BARS

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## OUR WAREHOUSE IS LOCATED WITHIN EASY TEAMING DISTANCE OF THE LOOP

When you have a job in town the place to buy steel is in town. You avoid any chance of delay due to car supply, embargoes, or freight movement.

The most important feature however is to avoid having a whole carload of steel dumped on your hands when you need only a few tons at a time.

*Try Our Service*

# CONCRETE STEEL CO.

**Monadnock Building**
**CHICAGO**

# Have You Investigated?

Half Bag Archer Mixer Delivering Direct Into Forms on Sewer Conduit Work

## Archer Mixers Are Proven Leaders

Do you want a mixer that will save you time on every job—a mixer that will enable you to get more work done with a smaller gang? Do you want a mixer that will save you so much that your extra profits will more than pay for the machine on your next job—or that will enable you to get more work by figuring lower? Then you must get the ARCHER—the original end discharge mixer.

Residences and farm buildings will constitute the majority of work next year. In this field the "half bag" ARCHER is, without question, unequalled.

**Let the ARCHER, Itself, Show You by Its Work How Much Better it is for You in Every Way. Write for "SHOW ME" Offer**

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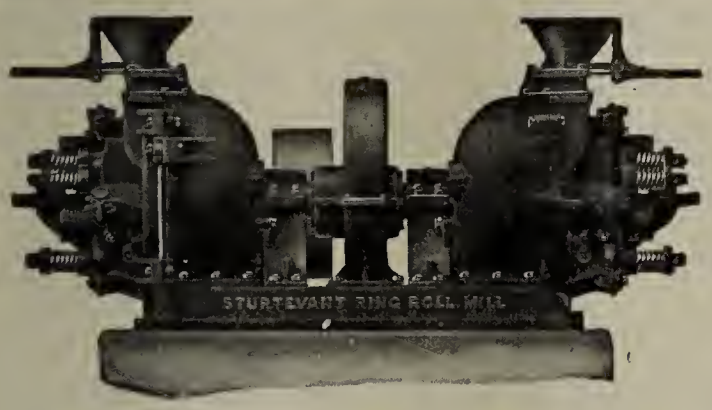


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**For CLINKER, LIMESTONE and COAL**

**THE LARGEST PRELIMINARY GRINDER BUILT**

CAPACITY PER HOUR ON CLINKER

80 TO 120 BBLS. TO 20 MESH WITH 80—90 H. P.
50 " 80 " " 40 " " 80—90 H. P.
50 " 60 " " 80 " " 80—90 H. P.

UPKEEP APPROX. $\frac{1}{10}$c. PER BBL.

he Ring-Roll Tube Mill Unit can produce cheaper cement from every standpoint — upkeep capacity, low power and continuous operation than any other. Ask the users, they can prove it to you, and we can.

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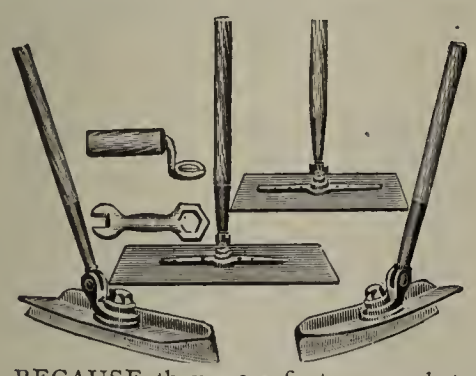

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BECAUSE they were first on market and have stood the test.
BECAUSE they are adjustable to any angle or height.
BECAUSE you can do your work quicker, easier and better.
BECAUSE one man can do work of five with short handled tools.
BECAUSE they save you time, labor and money.
BECAUSE you can try them 10 days against any others on the market; if you don't like ours better, send them back.

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**210 to 214 South Fourth Street, ST. LOUIS, MO.**

We make a specialty of supplying cement works with

**Chemical Apparatus, Chemicals and Reagents**

Gilmore's Needles, Cement Moulds, Vicat Apparatus, Schumann's, LeChatelier's and Jackson's Specific Gravity Apparatus, Etc.

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*Satisfaction Guaranteed*

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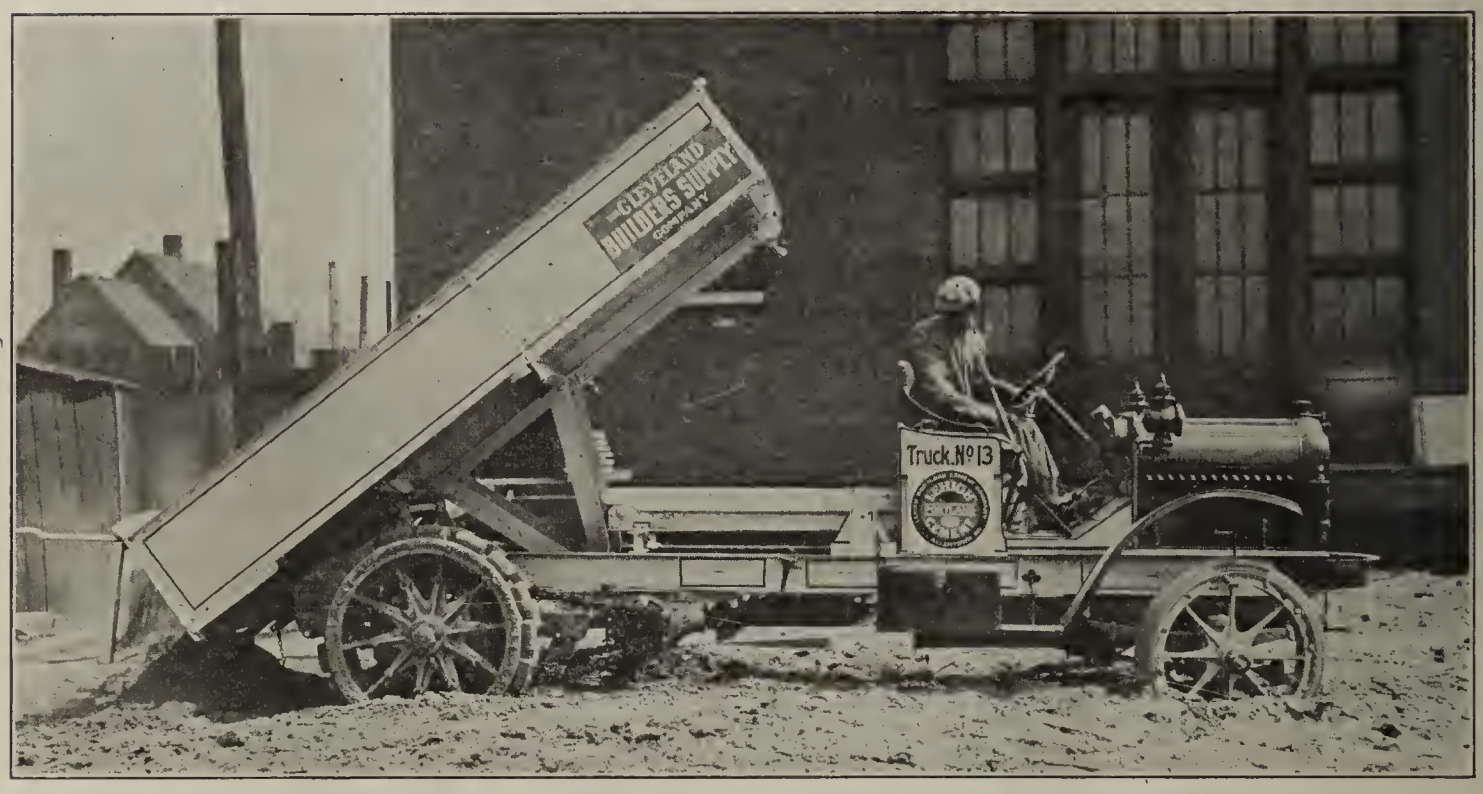


One of the nine White Trucks owned by The Cleveland Builders Supply Company

# WHITE TRUCKS
## Cut Hauling Cost

THE successful truck for use in hauling contractors' supplies and building material must be highly efficient, durable, dependable, easily operated and economical in operation and maintenance. White trucks meet these requirements from every standpoint.

Many builders supply companies have found the White 5-ton Dumping Truck to be the most efficient solution of their delivery problems. This truck may be loaded from a clam shell or hopper in a very short time and with much less waste than would be the case with a narrower body. The White Power Dumping mechanism, obtainable only on White Trucks, will dump a complete load in thirty seconds.

The performance of White Trucks in this country is so wel known and their distribution so widespread that they have gained predominance in practically every line of business where transportation is involved.

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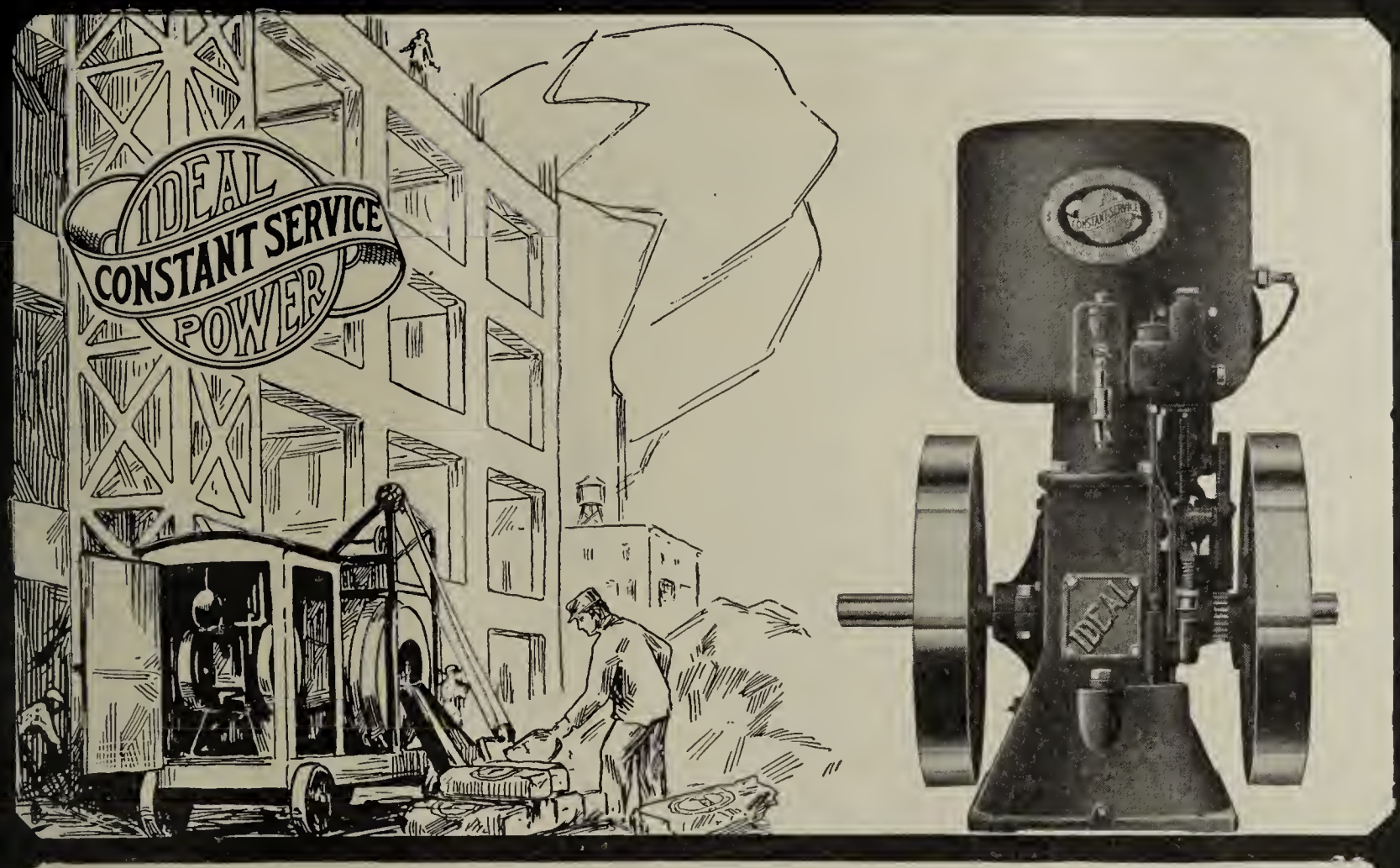
## THE WHITE COMPANY
CLEVELAND

*Awarded the ONLY GRAND PRIZE for Motor Trucks at the Panama-Pacific International Exposition, San Francisco*

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*Hopper Cooled, Frost Proof, Dirt Proof, Vertical Engines*

Ideal Engines are demonstrating their built-in reliability and fortitude in the day-in and day-out grind of heavy construction work.

They are furnishing power for concrete mixers, power loaders, hoisting and pumping outfits—giving dependable, constant, care-free service. Extreme conditions of weather never hamper their continued performance.

Correct in design—built of right materials with painstaking attention to details, and supported by years of experience in engine construction—Ideal Power is insurance to the contractor against costly engine tie-ups on the rush contract.

Always on the job—Ideal Engines are found in all lines of construction work in every part of the country.

Ideal Power is demanded by the contractor who insists on reliable, dependable economical equipment.

*Ideal contractor equipment includes Reversible Hoists, Single Drum Hoists, Double Drum Hoists, Water and Mud Pumps. Let us send you our catalog containing complete information about Ideal Engines and Outfits*

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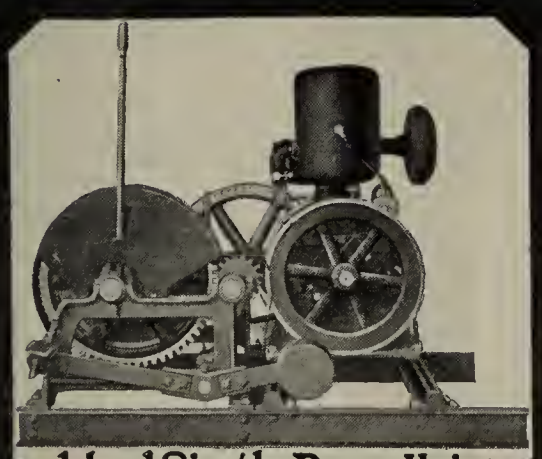
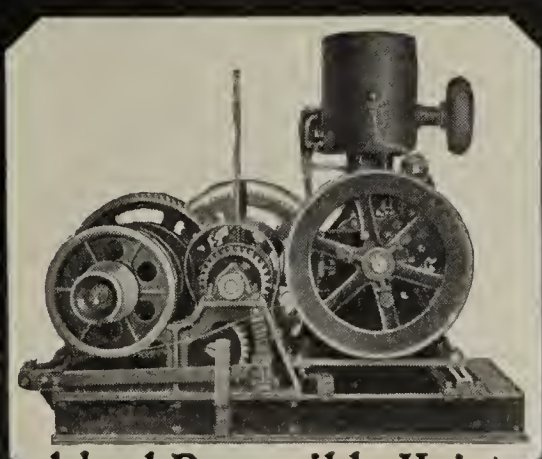
LANSING — R. E. OLDS, Chairman — MICHIGAN

804 East Kalamazoo Street



Ideal Single Drum Hoist



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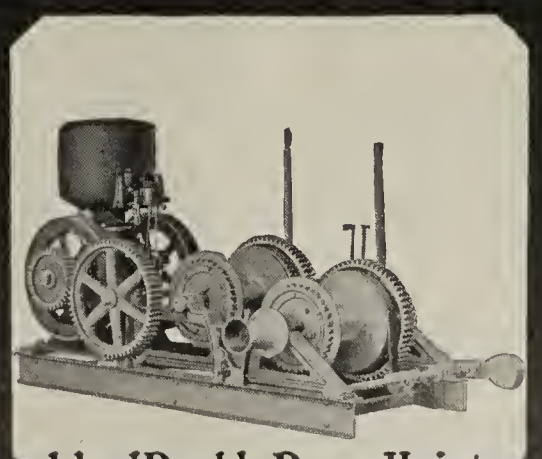
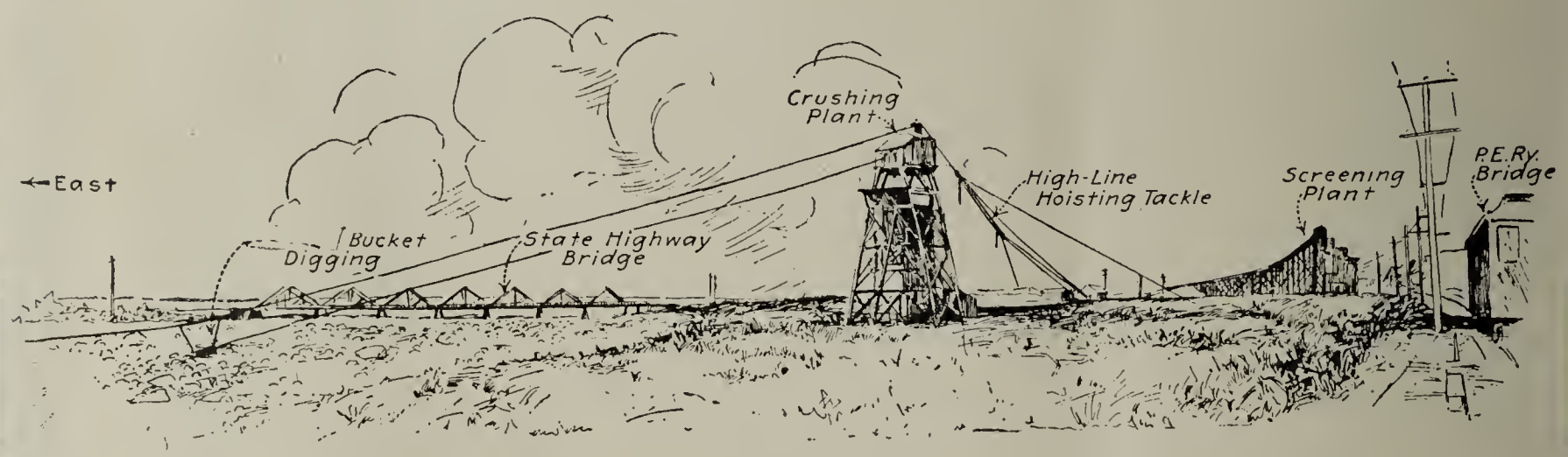


Ideal Double Drum Hoist

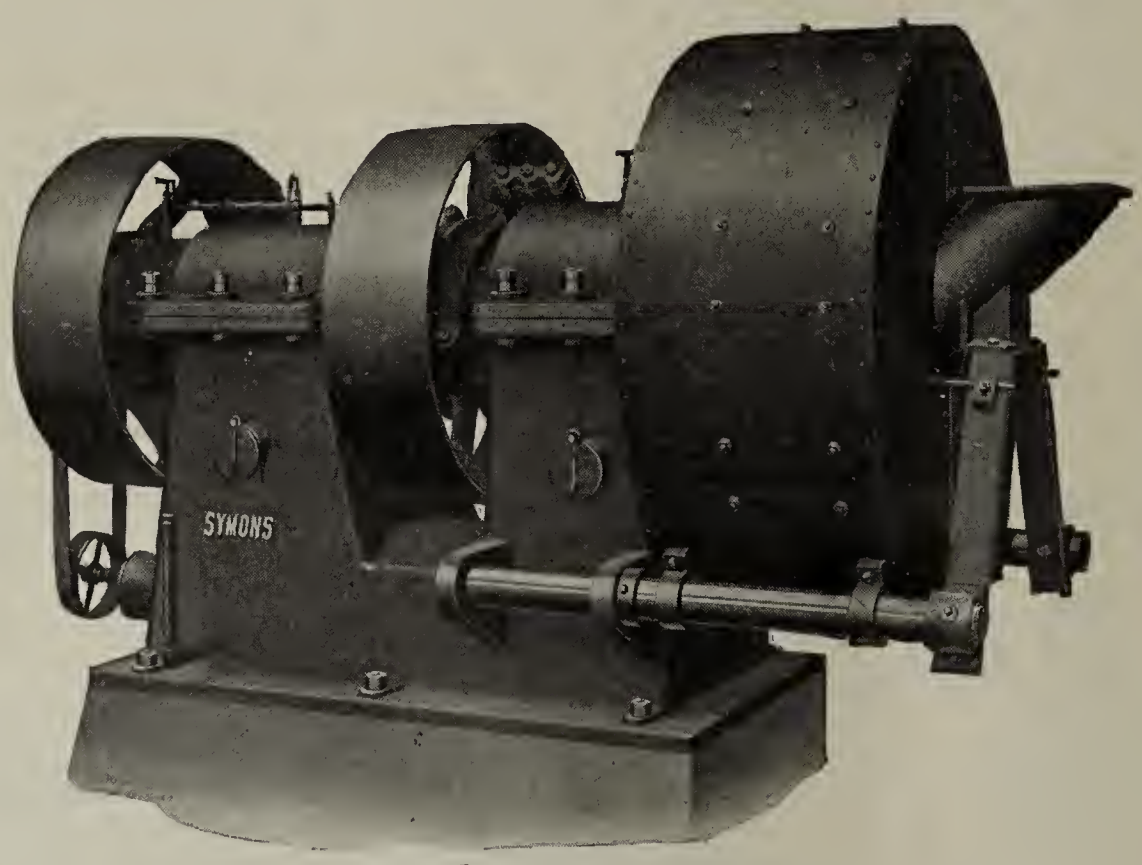
# A Modern Gravel Plant Equipped with a Modern Crusher




The new up-to-date electrically operated gravel crushing and screening plant of the Southern California Rock & Gravel Company, H. G. Feraud, President, recently placed in operation on the San Gabriel River near Los Angeles, Calif., is one of the largest and most complete of its kind that has been erected.

A very interesting, illustrative descriptive article concerning the unique features of this modern and successful crushing plant, which is equipped with 48 in. and 36 in. Symons disc crushers, appears elsewhere in this issue of Cement & Engineering News. The complete plant represents an investment of about $500,000 and has a capacity of 2,000 tons per 10-hr. day.

**Insure the successful operation of your plant by installing SYMONS DISC CRUSHERS**




**SYMONS DISC CRUSHERS are superior to Rolls, Jaw or Gyratory for crushing Gravel and Hard Heads**

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CHICAGO HEIGHTS, ILL.

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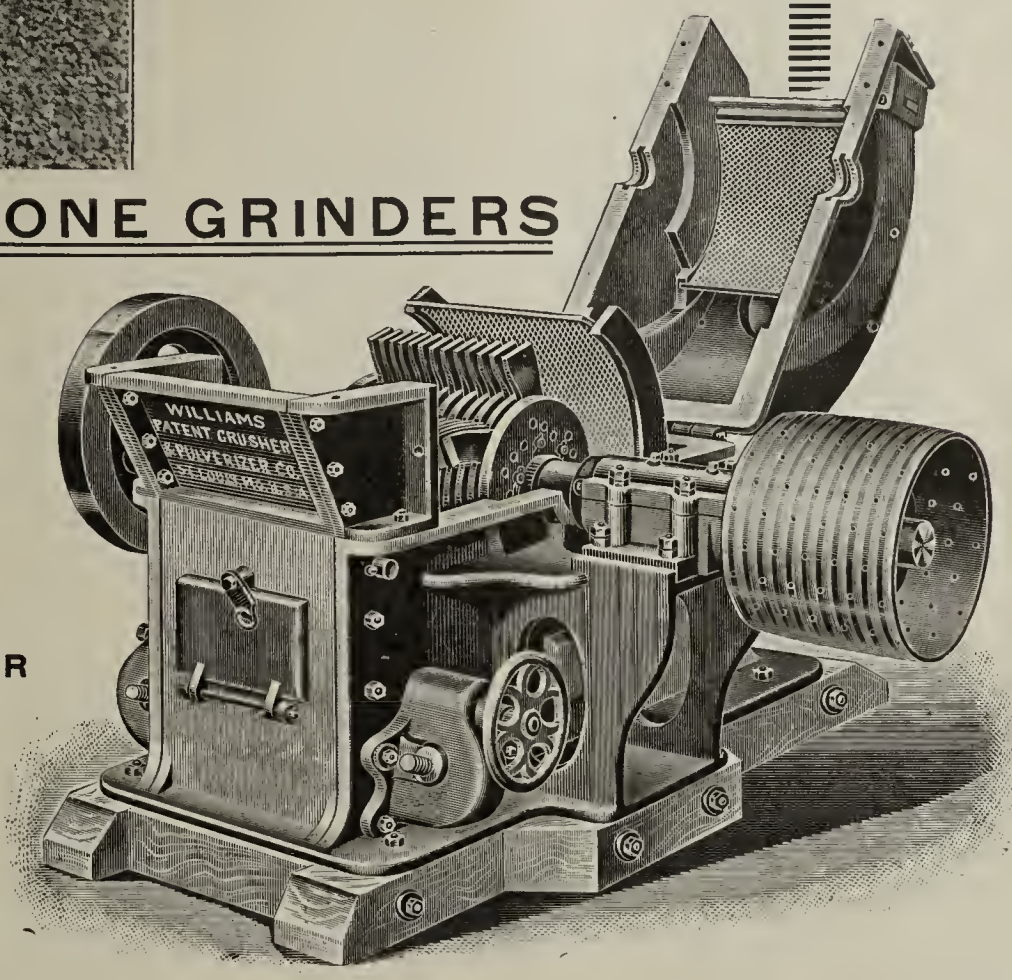
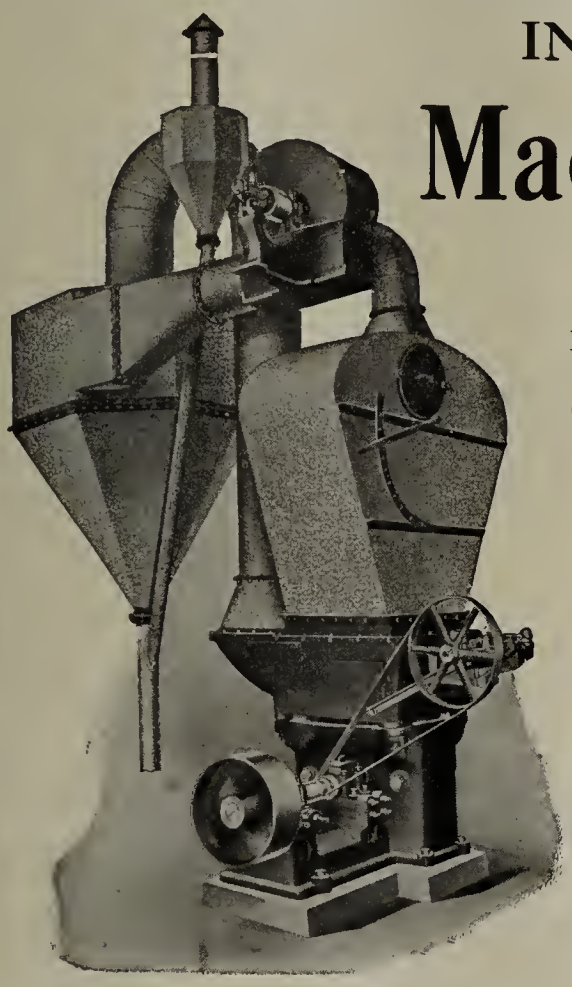
Convert your Limestone Screenings into something useful and into a commodity now greatly in demand, i. e., into Agricultural Limestone, by grinding same with The Williams' Universal Grinders, so successfully used by the pioneers in the Agricultural Limestone Industry. The Williams will take Limestone screenings and in one operation, without the use of outside screens or separators, produce a material ideal for Agricultural purposes. Learn more about this grinder by writing for Bulletin 17-A. L. to




**THE WILLIAMS PATENT CRUSHER & PULVERIZER COMPANY**
37 W. VAN BUREN ST.
CHICAGO

Plant: ST. LOUIS
67 Second St. SAN FRANCISCO

# Complete Grinding IN ONE Machine



In successful use grinding Cement, Clinker, Limestone, Coal

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NO DUST

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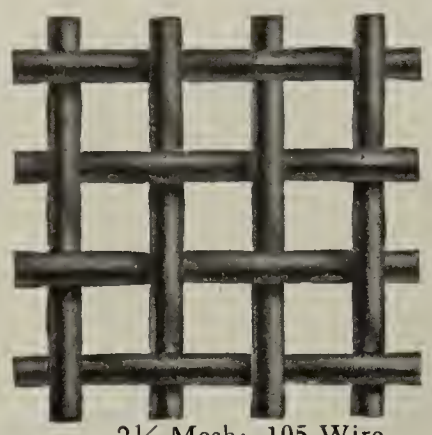
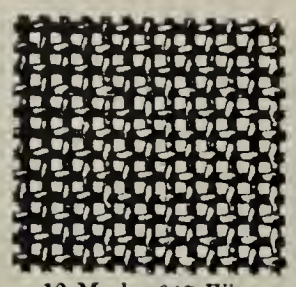
**NEW YORK**

## Cleveland Double-Crimped
# WIRE CLOTH



2½ Mesh; .105 Wire



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Renowned for its Uniformity, its Superior weave, its Durability. Especially adapted for SAND, GRAVEL and CEMENT Screens. A large stock of the various meshes always on hand.

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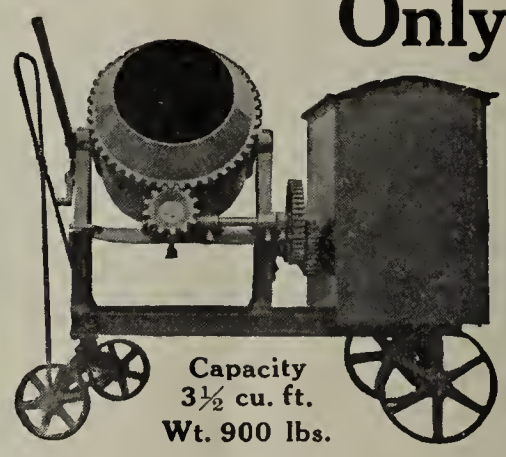
## Only $160.00



Capacity 3½ cu. ft.
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for this complete, all-steel power mixer, including trucks, engine and housing.

A great mixer for any class of work and good for jobs of all sizes.

**Hand or Belt Mixer $55.00**

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consists of all sizes and types of machines from 3½ to 10 cu. ft. capacity in both tilting and non-tilting types — *low charging — power loaders — all attachments.* Prices very reasonable.

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15/16 IN. HY-RIB (SEVEN-RIB). Ribs 15/16 in. high, 4 in. apart; sheets 24 in. wide.

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by using the complete line of material for use in all types of construction. Be sure of prompt delivery, as our complete stocks and large organization warrant immediate shipment.

# HY-RIB and RIB LATH

the acknowledged standard material, as used everywhere in all kinds of construction work.

The many depths, gauges and types of Hy-Rib adapt it to reinforcement of concrete floors and roofs. It is an ideal plastering surface for walls and ceilings and renders the building entirely fireproof. Easily put in place and on arched and curved work it is furnished bent to the exact curve.

Our complete line includes, in addition to the above, Diamond Lath in two types; Pressed Steel Channels and Studs of all varieties; four types of Corner Beads; three types of Base Screeds, etc. Send for free Hy-Rib Hand Book.

**For Concrete Roads**

Kahn Road Mesh
The most efficient reinforcement for concrete roads and pavements.

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Protect and reinforce concrete curbs.

Kahn Armor Plates
Perfectly protect expansion joints.

Write for Highway Pamphlet and estimates.

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## On HIGH SPEED Equipment

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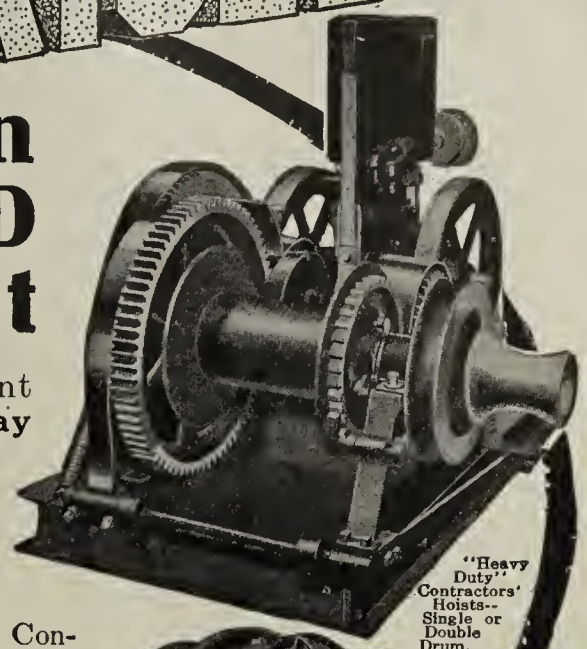
"Built of Steel" Equipment sold under **"Money Back" Guarantee.** Mixers for every purpose---**all used sizes**—4 to 22 ft. capacities. Hyatt Roller Bearings---all improvements. Hoists, Backfillers, Pumps, Elevators, Concrete Carts, Pavers, Grouters, Etc. Write for new 1918 Catalog---full of Equipment bargains.

**Building Mixers with Automatic Power Loader---Measuring Water Tank**



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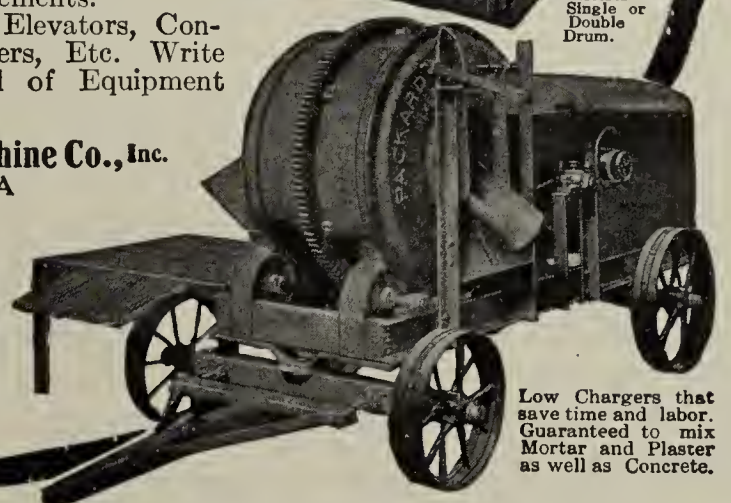

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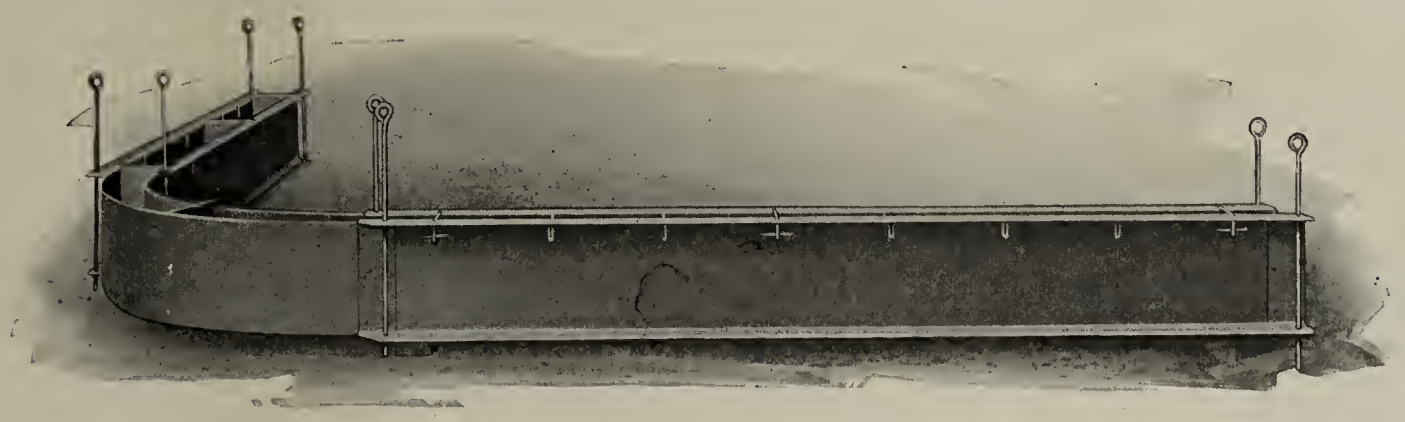

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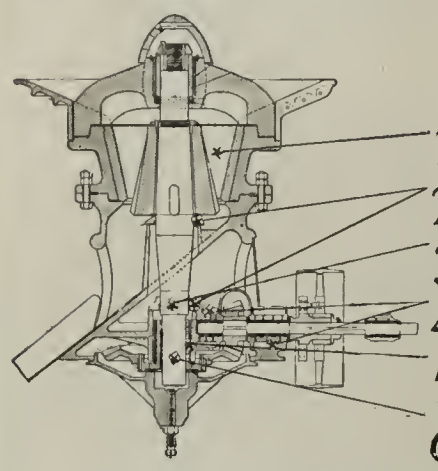
## GYRATORY CRUSHERS



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**Austin Manufacturing Company**
**CHICAGO**
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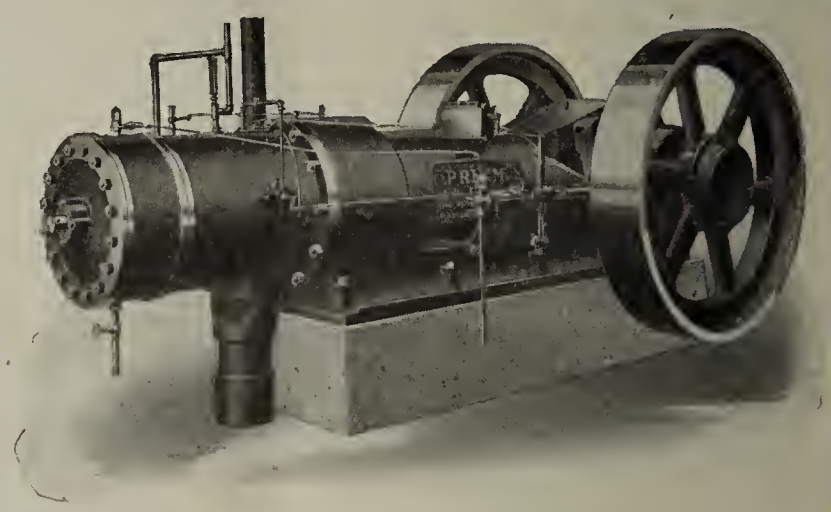

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# The Rugged Ruggles

## AERIAL CARRIER

**Suspended over Slate Quarry**

# SELF DUMP BRAK LOCK ING

**Built in Two Sizes:—1 to 5 tons capacity, 5 to 10 tons capacity.**

The **Rugged Ruggles** is made for special use on cement and gravel construction work. For all kinds of quarries where the waste is taken from the pit and dumped at the surface. It will take any load up to **ten** tons, from any depth to the cable, where it is automatically released and sent either up or down the cable and dumped in mid-air or lowered. One man can operate three **Rugged Ruggles** on as many cables with a three-drum engine:

**No brake to wear the cable—Can run on a flat cable.**

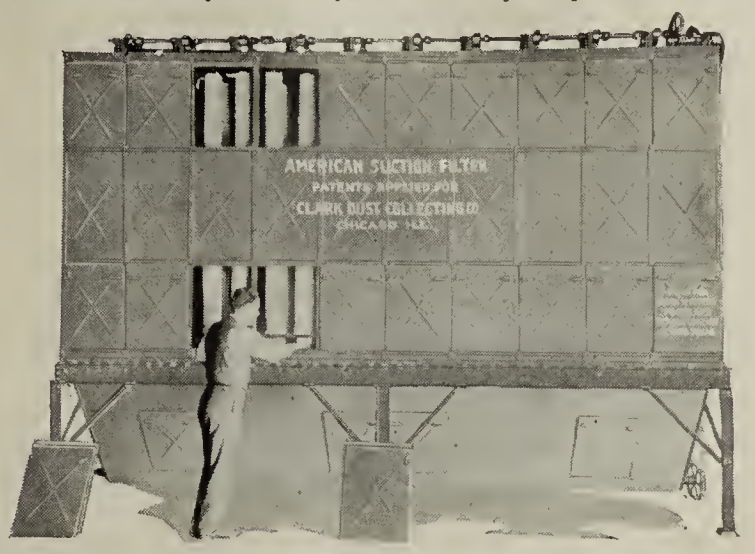
Simple in construction; made entirely of steel; all the sheaves steel bushed or brass, and is backed by years of extensive use.

**Manufactured by**

## Ruggles Machine Co., POULTNEY VERMONT Dept. C

# The *American* Dust Filtering Process

eliminates dust and collects and saves it; thus, saving your men, money and machinery, and increases efficiency of all departments of your plant.




## *The American Suction Filter*

can be used both on raw and finishing grinding on kilns for the recovery of dust and potash. *Write for particulars and data.*

**READ WHAT THEY SAY ABOUT IT**

**SOUTHWESTERN PORTLAND CEMENT COMPANY**
**Los Angeles, California**

Mr. W. G. Clark, Victorville, Calif.
Care Clark Dust Collecting Co., Saturday, Dec. 29th, 1917.
Fisher Bldg., Chicago, Ill.

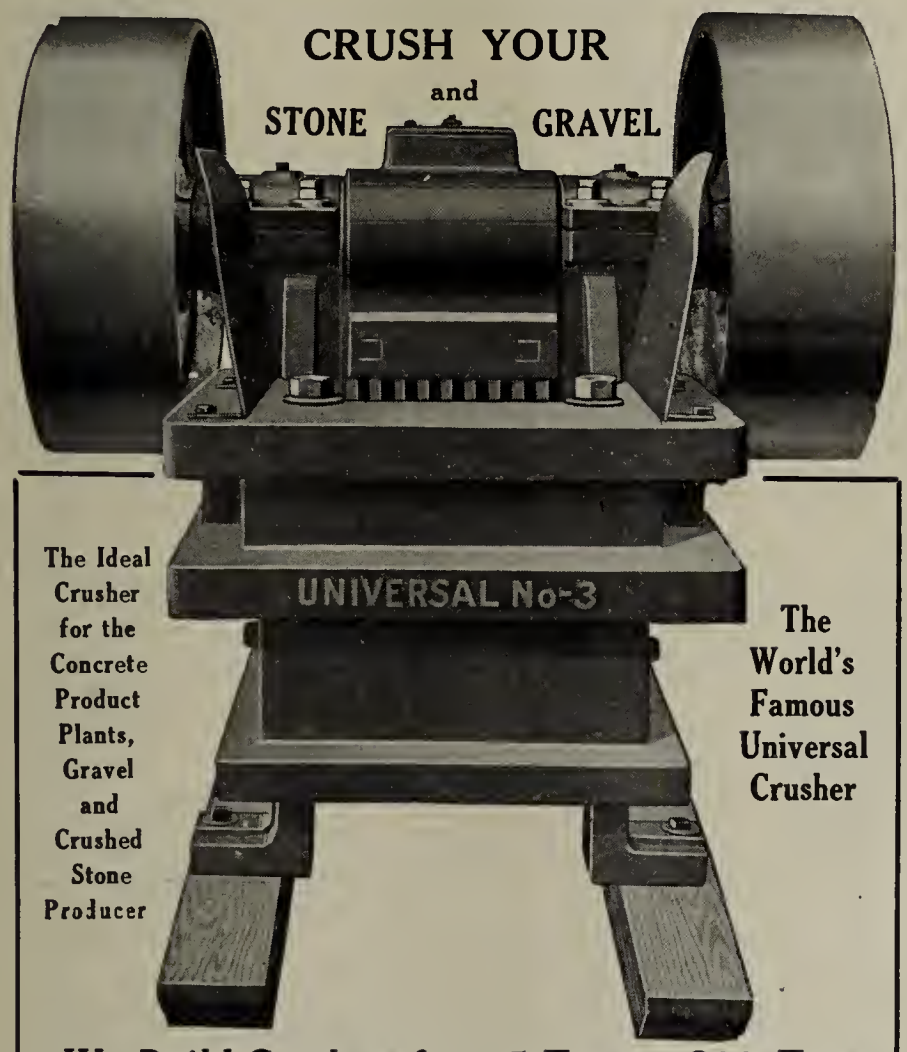
My Dear Mr. Clark:—

I have your letter of December 22nd, and in reply will say that we have your Dust Collector working in our Packing Department and is taking care of all the dust around the packing machines. The Collector is plugging away every day and is giving excellent results. So far we have had no trouble or repair work on the installation, and it is collecting all the dust around the packing machines, as you know these machines create a great amount of dust.

Yours truly, L. D. GILBERT, Supt.

**THE CLARK DUST COLLECTING COMPANY**
**Dust Collecting Engineers**
**FISHER BUILDING CHICAGO, ILLINOIS**

# CRUSH YOUR STONE and GRAVEL




**The Ideal Crusher for the Concrete Product Plants, Gravel and Crushed Stone Producer**

**The World's Famous Universal Crusher**

***We Build Crushers from 5 Tons to 300 Tons per 10-hour Capacity***

Instantly adjusted to produce size required from ¼ inch to 3 inches. *Write for Folder No. 14.*

## UNIVERSAL CRUSHER COMPANY

**230 Bee Ave Cedar Rapids, Iowa, U. S. A.**

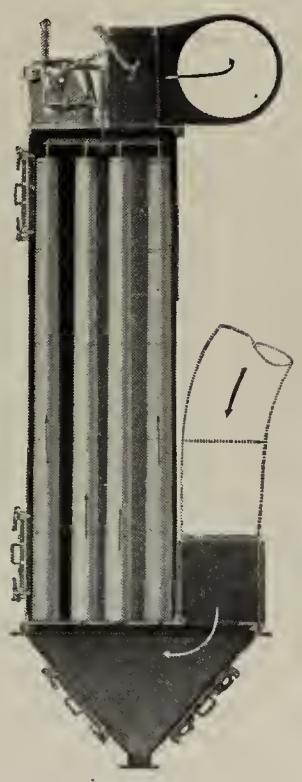
# The Allis-Chalmers Dust Collector

**DUST** *Increases the wear and tear on machinery*

**DUST** *Reduces the efficiency of your plant.*

**DUST** *Is the origin of disease.*

**DUST** *Is the cause of labor difficulties*

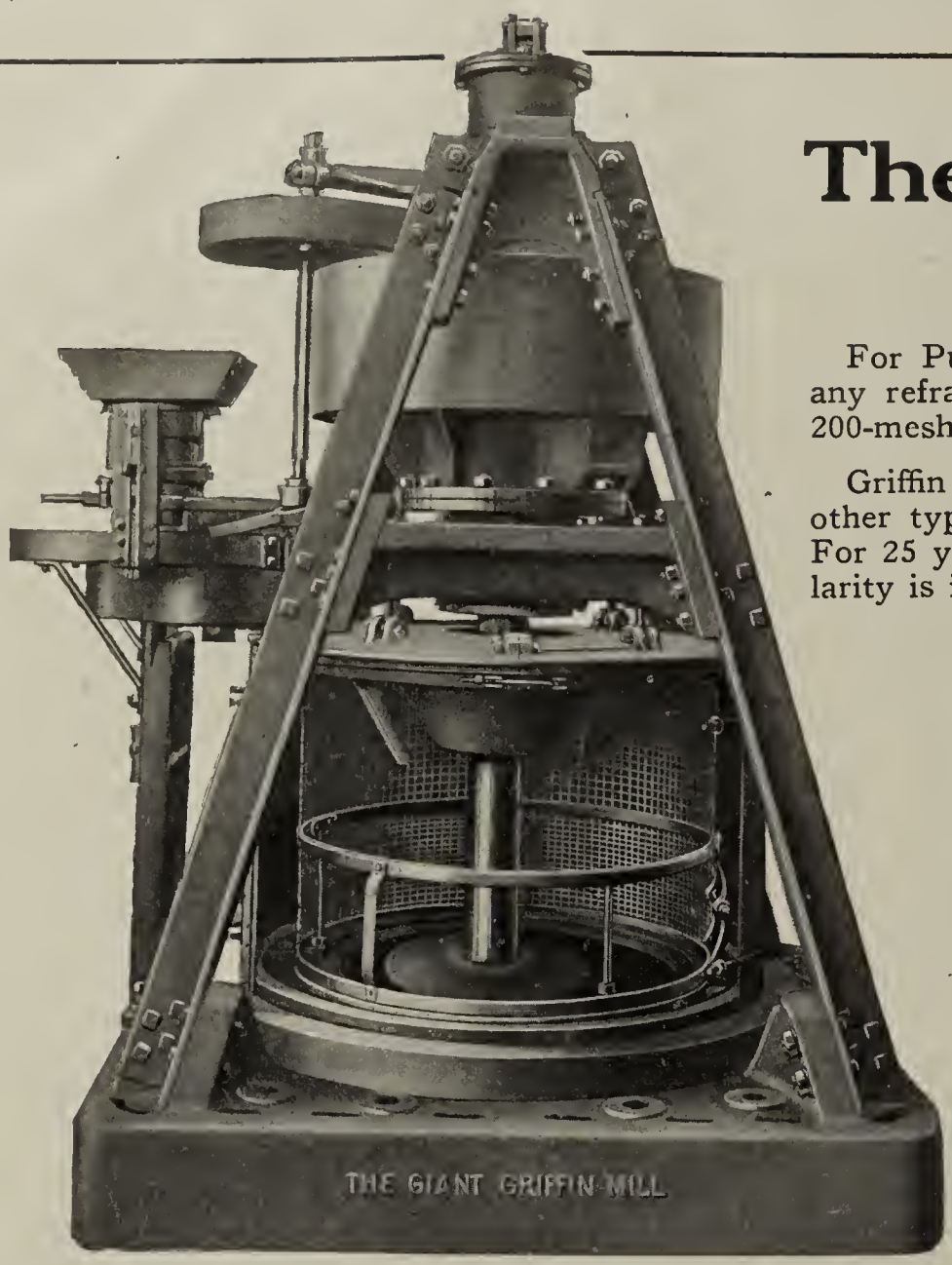


*Write for Bulletin No. 1454*

## ALLIS-CHALMERS MFG. CO.

MILWAUKEE, WISCONSIN

*Offices in all Principal Cities*




# The Improved Giant Griffin Mill

For Pulverizing Coal-Cement Clinker, Raw Material or any refractory material where a finess of 83% through a 200-mesh screen is required.

Griffin Mills are used by Cement Plants more than any other type of pulverizer. Now in operation in 45 plants. For 25 years they have led the procession and their popularity is increasing.

Recent improvements have reduced their former low H. P. and Maintenance Cost to the Minimum. Why not investigate this new Griffin Mill?

Recommended for Agricultural Limestone Producers as well as Cement Producers.

GRINDS ANY DRIED REFRACTORY MATERIAL.

Our Engineers Are at Your Disposal.

## Bradley Pulverizer Co.

**Works Allentown, Pa.**

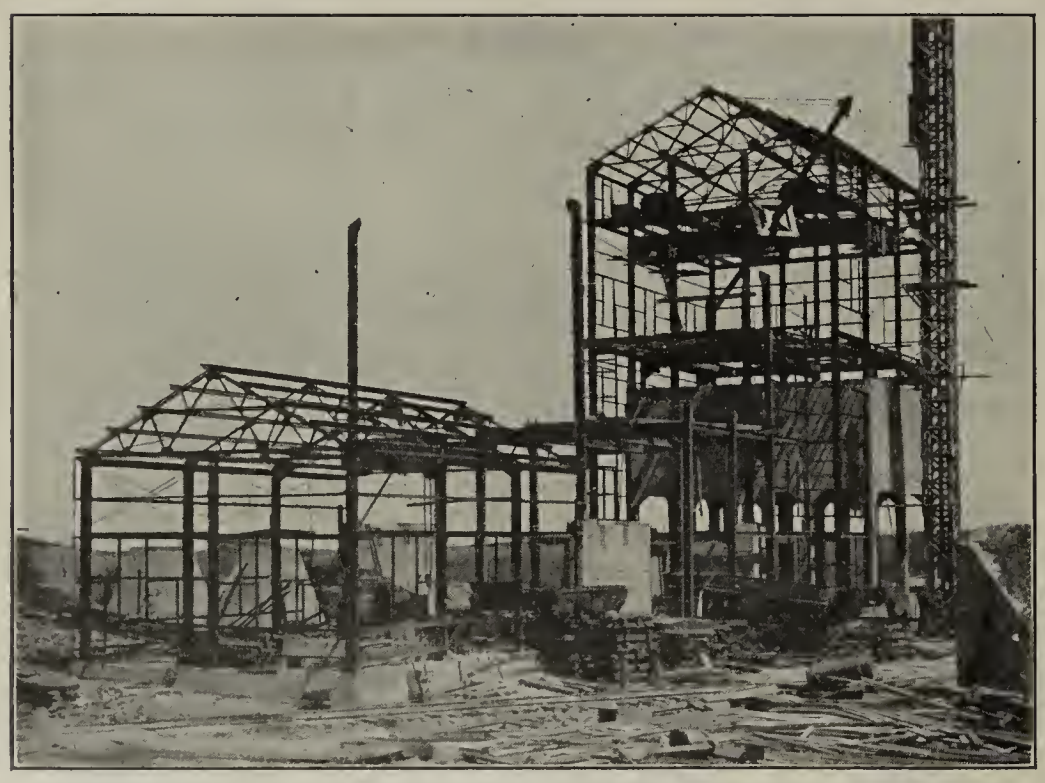
**BOSTON** **LONDON**

# "IT'S A BEAR"

FOR CRUSHING HUGE PIECES OF STONE WITH EASE AND MINIMUM POWER CONSUMPTION

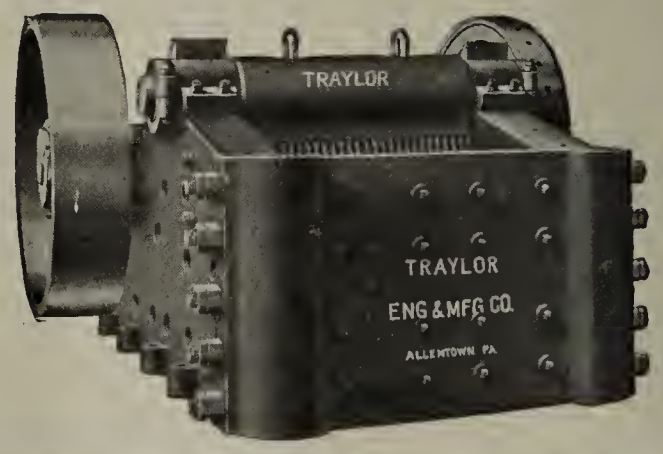
THAT'S THE

## TRAYLOR "TYPE C" Jaw Crusher



Crushing Plant of the Oklahoma Portland Cement Co., Ada, Oklahoma.

When this Company installed the Traylor 36x72 in. Type C Jaw Crusher, they eliminated unnecessary waste of POWER, LABOR and COSTLY SHUTDOWNS for reasons fully described in Bulletin J1—GET IT.




## TRAYLOR ENGINEERING & MFG. CO.

New York Office: 30 CHURCH ST. | Main Office and Works: ALLENTOWN, PA. | Western Office: SALT LAKE CITY

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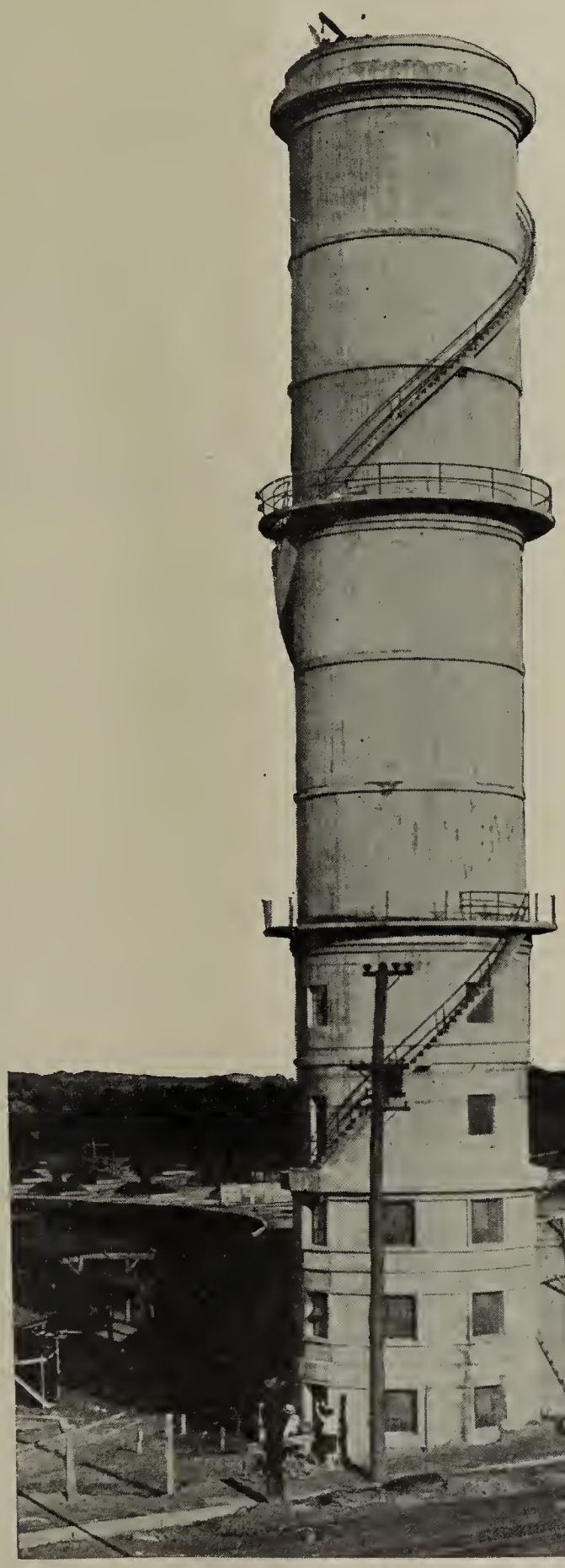
# Cement and Engineering News

Vol. 30 May 1918 No. 5



## A Remarkable Reinforced Concrete Water Tank

Here is a splendid example of the complete satisfaction that properly-built reinforced concrete water tanks will give.

This splendid structure serves the South's greatest and most modern cotton warehouse, built at Atlanta, Georgia, for the Atlanta Warehouse Company.

This tank holds 200,000 gallons. The lower part of the structure is used as offices by the Atlanta Warehouse Company, and not one drop of water has ever leaked through the tank from either sides or bottom.
All of the buildings, including the water tank, were designed and constructed by Arthur Tufts, engineer, Atlanta, Georgia.

# CEMENT AND ENGINEERING NEWS

with which Gravel & Stone Magazine is incorporated

(PUBLISHED MONTHLY)

**WILLIAM SEAFERT, Editor and Publisher**

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Advertising copy or changes in ads. must be in this office by the 25th of each month, as hereafter our magazine will appear on the 5th of the following month

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JOHN F. WALDRON - - - - - - - - Advertising Manager

## CHICAGO, MAY, 1918


## Concrete Silos

Anyone who took a trip through the country last spring and had an eye for nature could readily see that the corn had an unusually late start. In former years, the corn used to be "knee-high by the Fourth of July," as the saying is around Chicago, and it was not an unusual occurrence to see it that high by the middle of June. But last year it was hardly four inches high along the border line of the states of Illinois and Wisconsin during the first week of July. A thoughtful mind, therefore, could not help being apprehensive of the future of the corn crop. An extraordinarily large acreage was planted in corn last year; however, any loss, no matter how small, would have meant a great deal on account of the world's shortage in grain. The late start, caused by cold, damp weather in the spring, could possibly be offset only by a very hot summer. As it takes the corn a hundred days to mature, it was obvious that nothing but unusually hot weather in August and September might save the crop in the northern states. This would have made good what the early spring months failed to do. However, the summer was delightfully cool and unfortunately did not happen to be a repetition of the year before. Consequently the corn matured only in the southern states, while three hundred million bushels in the big corn states of the North had to be cut green and in this state to be fed to cattle. This was preferable to taking further chances on possible ripening of the corn and on exposing it to early night frosts.

These happenings a layman could easily foretell last year before the summer had advanced very far. For the farmer they must have been, not possibilities, but absolute certainties. He could not have planted his land to corn so late in the year without having known almost for sure that disaster would overtake his crop, and yet, what did he do to meet the emergency?

Many farmers in the northern states of the corn belt are prepared for just this kind of a surprise to the crop; but how many are not? It is a conservative estimate to assume that a hundred million dollars' worth of last year's corn crop went to destruction owing to lack of facilities for keeping the soft corn that was cut green. Only on farms with silos could the green corn be kept through the winter and have served as food for the cattle; on all other farms a comparatively small amount was consumed before it spoiled.

One hundred million dollars lost to the nation through negligence! This sum could have built one hundred thousand concrete silos and could to as many farmers have obviated similar embarrassment in the way of taking care of green corn for all time to come.

For Heaven's sake, Mr. Farmer, wake up and get busy! We need your assistance in this world war! Have we not published enough about "silos" to convince you of their merits? If not, please let us know, and we will supply you with bushels of literature from other sources. No longer can you claim not to be able to afford the expense. You have grown rich during the past four years at the expense of all others. Your grain and your cattle sell at three or four times the price of five years ago, and you obtain for your dairy products and vegetables at least twice as much as you used to get. This is the time to transform your farms into model establishments from every point of view. Now use a little common sense; spend less for automobiles and similar luxuries; save a little for improvements on the farm and, first of all, build a concrete silo, one of the most durable type, one that will be a monument to your forethought and intelligence and will relieve you of all worries in the future, because it will be a moneymaker for you, no matter whether your corn has an early start or is kept back by unseasonable weather. Let this last year be a lesson to you. Erect a concrete silo immediately and, by doing so, "do your bit" for the country.

## Safe from Gold Bricks

Liberty Loan Bonds are a proper investment for all people of small means. Most of the wage earners and people who receive small incomes and salaries, are almost sure to lose money if they invest it. All sorts of get-rich-quick schemes are forced on them and they never have the means of knowing what is good. Nine out of ten of this class would be better off if they put their savings in a safety deposit vault and received no interest on them. The gold brick peddlers, the promoters, the oil stock and gold stock solicitors, get rich out of this class of people. The third Liberty Loan bonds, drawing 4¼ per cent interest, without any taxes, if in the hands of people of small income, can be sold at any time, if the holder wishes the money. They are certainly a good investment for the ordinary man.

## Says Concrete Construction Laws Antiquated

Boston building laws as they relate to concrete construction, were declared to be ten years behind the times by speakers who appeared at a recent legislative hearing in that city at which proposed changes were discussed. The suggested amendments, which were proposed by the Master Builders' Association, the Boston Society of Architects, the Engineers' Association and the Building Trades Employers' Association had to do mainly with concrete foundations and the strength of foundations. William H. Sayward, representing the Master Builders' Association, told the legislative committee that the proposed amendments would place Boston on a par with New York and Chicago. There was no opposition and it is expected that the committee will report favorably on the bill.

# *Motor Trucks and Good Roads Help to Government*

Only Relief from Railroad Congestion, Industrial and Commercial Stagnation and Extortionate Charges Is Highway Haulage, Operated to Locality Requirements, and Affording the Certain Service the Business Men Can Rely On.

Under present conditions, when the railroads are taxed to their utmost with the imperative demands placed upon them by the many military necessities and the task of moving sufficient coal and steel to supply the domestic and industrial requirements, less than carload shipments of all classes of freight must be looked upon with the greatest disfavor, and are in many cases being flatly refused. Such refusals are not through antagonism or spite, but are imperative in the present emergency, when every resource must be used to the maximum for national defense. Small shipments require practically the same amount of equipment, time and motive power as do large ones, and are therefore to be avoided.

The only possibility of immediate relief is by the systematic use of motor trucks, which are already being used for shipments as large as five tons for distances as great as two hundred miles, and the probabilities are that the maximum in distance has not yet been reached, especially for emergency shipments where troubles from delayed or lost articles must be avoided. Large industrial companies already have under serious consideration plans for increasing the uses of trucks for such purposes, and the established truck express lines are enjoying increases in patronage.

In many cases the use of heavy trucks and vans is essential to success for both long and short hauls, and drivers are being used in relays so that one sleeps while the others handle the car. This permits the constant day and night use of the truck to maximum efficiency.

Used pleasure cars, especially those of strong construction, can be used to excellent advantage, especially for light loads and long rush trips. The labor and expense of converting them into light trucks are small, and their use as such gives temporary relief to the truck manufacturers, already crowded with army orders for trucks and other machine parts.

The automobile, once feared by the railroads as a serious competitor, is now in a position to be their means of deliverance from serious over-congestion.

The government is showing what can be done along this line. It has recently announced the opening of a one hundred mile motor parcel post route between Philadelphia and Baltimore and the service will soon be extended so as to include New York and other large cities.

How far this relief can be extended is a matter of personal endeavor and of co-operation. In many cases raw materials can be trucked to their final destination even when they are of a bulky nature. Many finished products lend themselves readily to this form of transportation, and customers can be served more promptly and economically by the truck than would be possible by a delayed rail haul. Some districts are already served by auto express lines and their usefulness can be still further increased by both buyers and sellers pooling their interests so that all empty or light load return trips are replaced by capacity loads.

Good roads mean good things for all, for the breaking of blockades which tie up merchandise must be effected by means of the cross-country highway. The motor truck is to bring the relief so urgently needed. Motor trucks must bear a double responsibility; hauling merchandise over existing highways, and hauling materials for extending the hard road mileage of the country. In lieu of gondola cars for highway and street building materials, motor trucks are hauling crushed stone, sand, concrete, asphalt and other road-making materials. This illustration shows an "Acme" motor truck delivering crushed stone for new roads.

## The Reason for Concrete Roads

Concrete roads are superseding branch line railroads with their expensive and limited train service on the one hand and earth roads with their expensive mud restrictions on the other.

The reason is very plain—both types of road cost too much for the service rendered.

Concrete roads fill the gap between railroads that afford a speedier movement than the volume of short-haul tonnage requires in economical handling, and earth roads that are not speedy enough.

Concrete roads accommodate all types of vehicles and afford an unlimited and flexible service. Short line railroads afford a limited service for only one type of vehicle, and the people don't own that. Not every one owns a railroad train; nearly everyone now owns an automobile.

With concrete roads every farmer can run his own train (motor truck and trailer), and he can run it on his own time, starting and stopping when and where he pleases. He owns the road, so long as he drives to the right.

Railroad trains—either steam or electric—running around farms to pick up freight are impossible from an economical standpoint. They serve a need economically up to a certain point, but that point is too far away from the farmer's gate.

Hence the concrete road—for all types of vehicles, any hour, any day, any kind of weather, meeting the weight of modern traffic and affording rapid, flexible, dependable and economical service.

The reason for the concrete road is very plain. It makes two roads pay where one could not pay before.

Concrete roads bring the freight station to the farm.

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Attend the American Concrete Institute convention June 27, 28 and 29, Atlantic City.

# *The Concrete House*

By Milton Dana Morrill, Architect, Washington, D. C.

In a few years' time reinforced concrete will be as much of a standard construction for house building as it has become for the sidewalk or street pavement. The supply of sand and gravel as well as the proper material for making Portland cement concrete is practically inexhaustible. Improved machinery, power mixers and steel forms have all helped to reduce the cost of concrete work.

Concrete stands to-day not only the best, but also the cheapest permanent construction, and foresighted contractors are more and more specializing in concrete work. In the house herewith illustrated six different exterior designs have been made. This gives some choice, and in a suburban development it is possible by the use of this plan to put up standard houses in rows and still get considerable variety in appearance without great increase in cost. A rectangular plan has been adopted for this house because it gives the maximum of convenience at the minimum outlay.

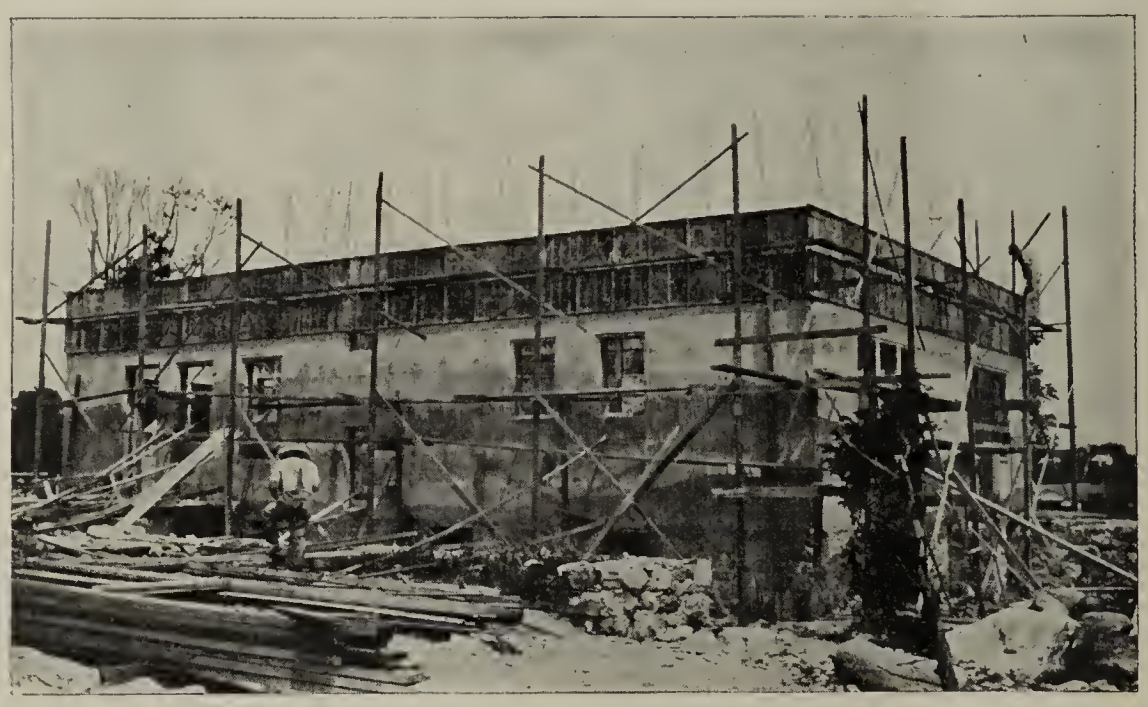
The reader will note that not an inch of space has been wasted. The screened porch can be enclosed with sash to serve as a vestibule at the time of year when this is needed. The rooms open together, which gives a spacious effect. All the rooms have wide windows on two sides. Long low lines and wide low windows seem especially suited to concrete house design. The walls are best covered with a dash coat of cement stucco. This may be finished rough or smooth and in different tints. By this means great variety can be obtained in a group of these houses, although they can be of the same plan and interior arrangement.

The planting about the concrete house should be in evergreens, as far as possible. Vines cling well to these stuccoed walls, and window boxes lend a touch of color which adds much to the attractiveness of these houses. The poured concrete walls with the stucco finish are proof against the passage of any dampness, but the exterior walls should be lined with furring strips, just as is customary in brick and stone construction. This makes a wind-proof building and a house which is very warm in winter and cool in summer.

The design shown may be carried out with only the exterior walls of concrete and the interior of the usual frame construction, or if a more fireproof construction is desired the first floor may be made of reinforced concrete. The surface of this floor slab may be covered with a hardwood flooring, or the concrete slab may be polished and waxed and covered with rugs. The next step would be to make the partitions and second floor construction of reinforced concrete, having only a wooden roof.

If it is desired to build an entirely fireproof house the roof can also be made of concrete, but if this is done it is better to adopt one of the flat-roofed designs, as a flat slabbed roof is less expensive and better suited to be carried out in concrete construction.

In order to do away with the high cost of wood forms, the writer developed for his own use a simple system of patented steel forms for concrete work. The first cost of these steel forms for house building is about $600, but as they can be used over and over again the cost per house becomes a small item. The reader will note that the work is done by two tiers of steel plates which are so hinged together that they are swung up the wall with a hand-over-hand motion as the work goes on.



**Pouring a Concrete House with Morrill Molds**

The window and door frames for use in these concrete walls should be so made that they can be set in the forms and the concrete poured around them. Several different kinds of frames are shown by the details. The frames should be made with a reveal strip attached; this strip is removed as soon as the work is done and the usual staff bead is then applied.

The estimated cost of this house where six or more can be built at one place is $3,888.00. This figure is based on first-cost construction throughout and on a finished house ready for occupancy.

The accompanying details may help to clear up some of the kinks in concrete house construction.

Fig. I gives the detail of installing a cellar window in a concrete wall. The window frame, at the time it is made up in the shop, should have the construction strips added as shown, so that it may be placed in the forms and the concrete poured around it. After the forms are removed the construction strips are removed and the window frame itself is secure in place.

This figure also shows how a door frame is placed in a concrete wall and how the door sill is moulded in concrete. By placing batten strip and striking the plastic concrete off with a template a door sill of concrete is easily constructed.

Fig. II shows different methods of installing double hung windows in concrete walls. The frames in all

# Six Different Developments of a Standard Plan for a 7-Room Concrete House

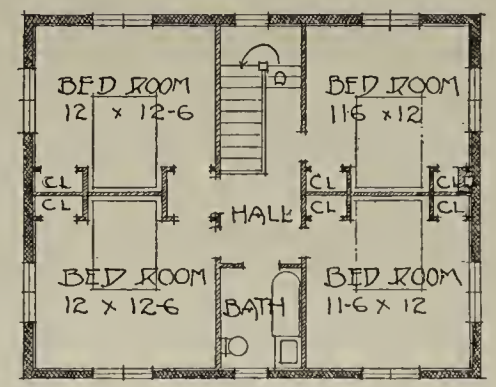
MILTON DANA MORRILL, *Architect*

THE CRAFTSMAN HOUSE

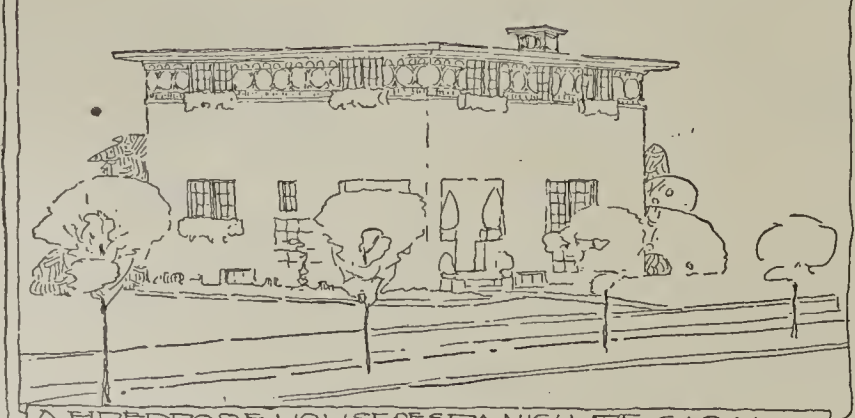
THE HOUSE WITH A MID ROOF

THE NEW ENGLAND HOUSE

FIRST FLOOR PLAN

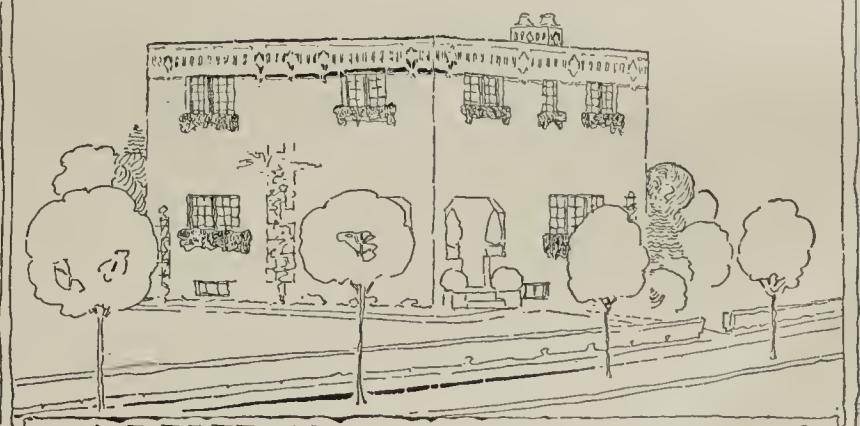



SECOND FLOOR PLAN



A FIREPROOF HOUSE OF SPANISH DESIGN

A DUTCH COLONAL HOUSE



A FIREPROOF HOUSE OF ORIENTAL DESIGN

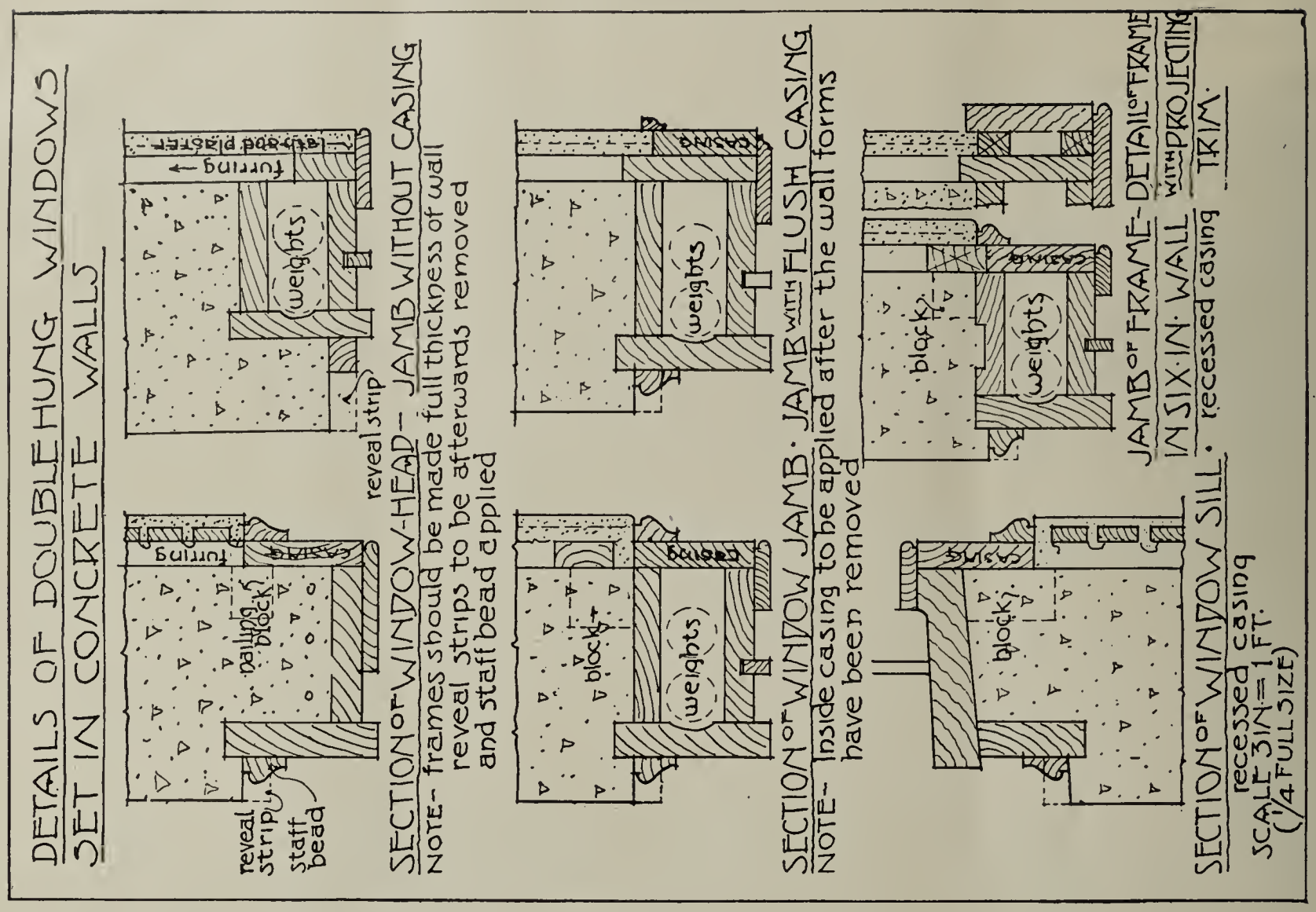



Plate II. The Concrete House

cases should be made the full thickness of the wall. The reveal strips are later removed and replaced by a staff bead moulding.

Fig. III gives the detail of casement window construction. This detail also shows how to attach and place furring strips on the inside of the poured concrete wall to provide an air or insulating space against the penetration of moisture or dampness. The nailing block is inserted in the concrete at the time it is poured by placing it on the inside of the form. If it is not beveled it should have nails driven in it to secure it firmly in place. The furring strip makes the air chamber and is the base to which the lath is nailed.

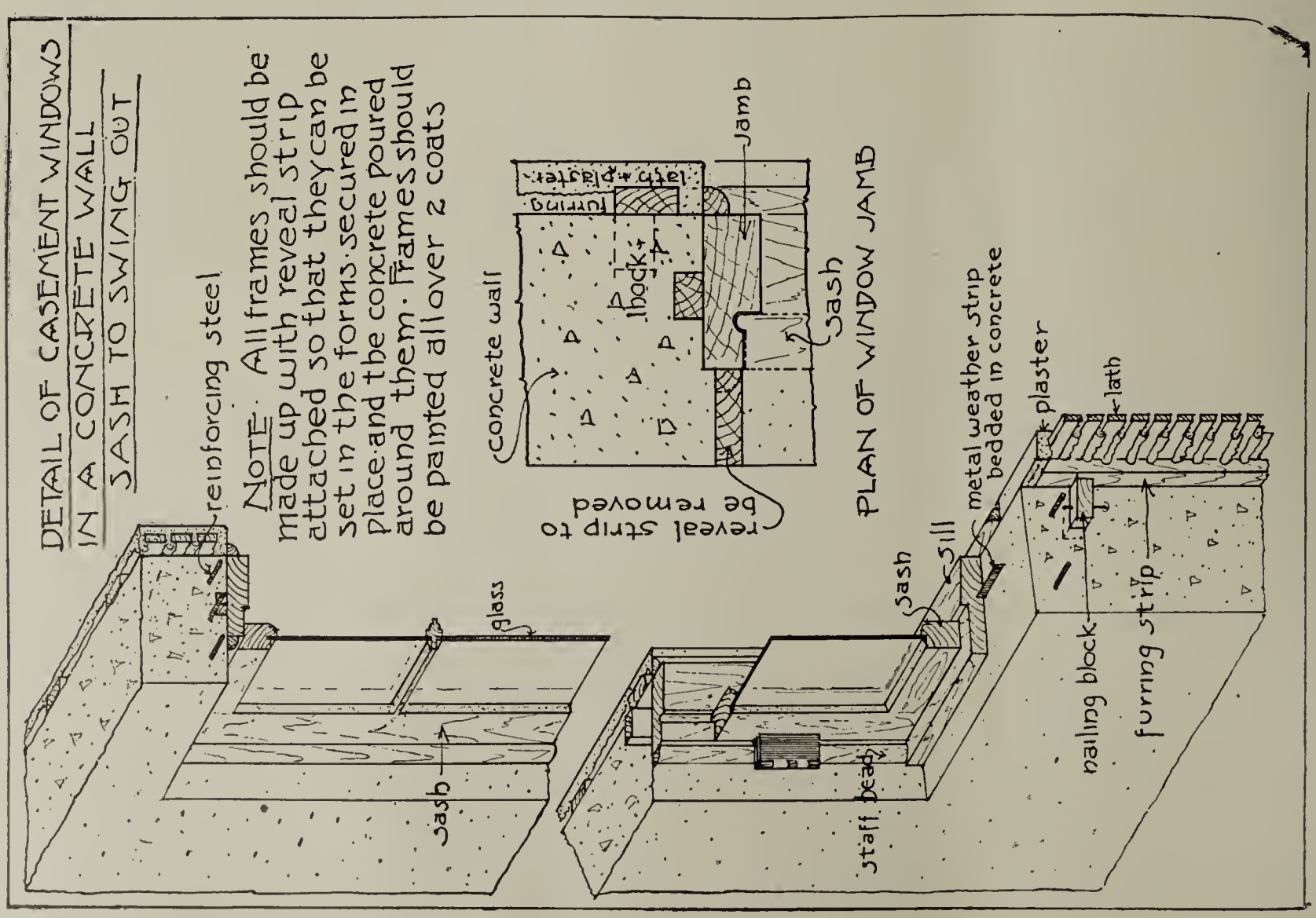



Plate I. The Concrete House

## Irrigation Project Requires Great Quantity of Concrete Pipe

Work on the largest concrete pipe job on record is being pushed in connection with a 125-mile line of 14-inch and 18-inch pipe at Fresno, California. The Boston Land Co. has a 15,000-acre tract of land upon which irrigation is necessary. About 2000 feet of 2-foot lengths are cast and placed daily in a casting yard covering about five acres. Work was started about a year ago and it is estimated that it will take another year to complete the job. Burt Brothers of Los Angeles have the contract.

## $50,000,000 for Concrete Ships

An appropriation of $50,000,000 is planned by the United States Shipping Board for the development of concrete shipbuilding, the first vessels built to be oil tankers needed because of the shortage of oil carriers. Three of the plants will be located in the South and two on the Pacific coast, one Southern yard having already been announced for Wilmington, N. C. Each of these shipyards will require an investment of probably $25,000, and the Emergency Fleet Corporation has announced that three 3500-ton and four 7500-ton oil tank steamships will be constructed of concrete at the Wilmington plant. These seven vessels will cost about $6,000,000, and it is understood that $3,000,000 of this will be represented in the payroll. From four to seven ways will be constructed at each yard.

Chairman Hurley of the United States Shipping Board and General Manager Piez of the Emergency Fleet Corporation are said to favor the immediate construction of these concrete shipbuilding plants because of the urgent need for oil carriers and because vessels of this type can be completed in much less time than is possible for a steel steamship. Ready access to cement and sand, with ample transportation facilities, will govern the choice of locations for the five plants. Southern and Western locations are preferred where there will be no cold weather to interfere with the pouring of cement. During May the plans and specifications will be completed for the 7500-ton oil carriers, each to be equipped with oil-burning reciprocating engine capable of steaming these tank ships at seven to eight knots per hour.

The necessity for making substantial gains in tonnage is fully realized by the Shipping Board. It is not numbers of ships but capacity that is needed at this time. Investigations have shown that the size of the concrete ships can be increased without materially affecting the period of construction, or the cost, while the large vessels are much more profitable in operation. This condition also applies to steel and wooden ships and the new program contemplated by the Shipping Board provides for steam vessels of 5500 tons and larger, wooden ships of 5000 tons and concrete ships of 7500 tons.

The shortage which is now affecting the work in the steel shipyards, due to the inability to get plates from the mills has further determined the Shipping Board to increase its contracts for concrete ships. There will be no difficulty encountered in obtaining the materials for these ships. The yards can be constructed at almost any point on the seaboard, with but slight preparation, and the materials for making concrete are widely distributed and practically inexhaustible. Moreover, they are not being used to any extent in other branches of war work.

It is logical to expect a large portion of the concrete shipbuilding to be located in the Southern States. In that section of the country there is an ample supply of the unskilled labor such as is largely used in concrete work, the absence of freezing weather in the winter permits continuous work, and there is but little of the industrial congestion which handicaps the shipyards in some other sections. The decision of the Shipping Board to place its first concrete yard in the South is evidence that the advantages are fully appreciated.

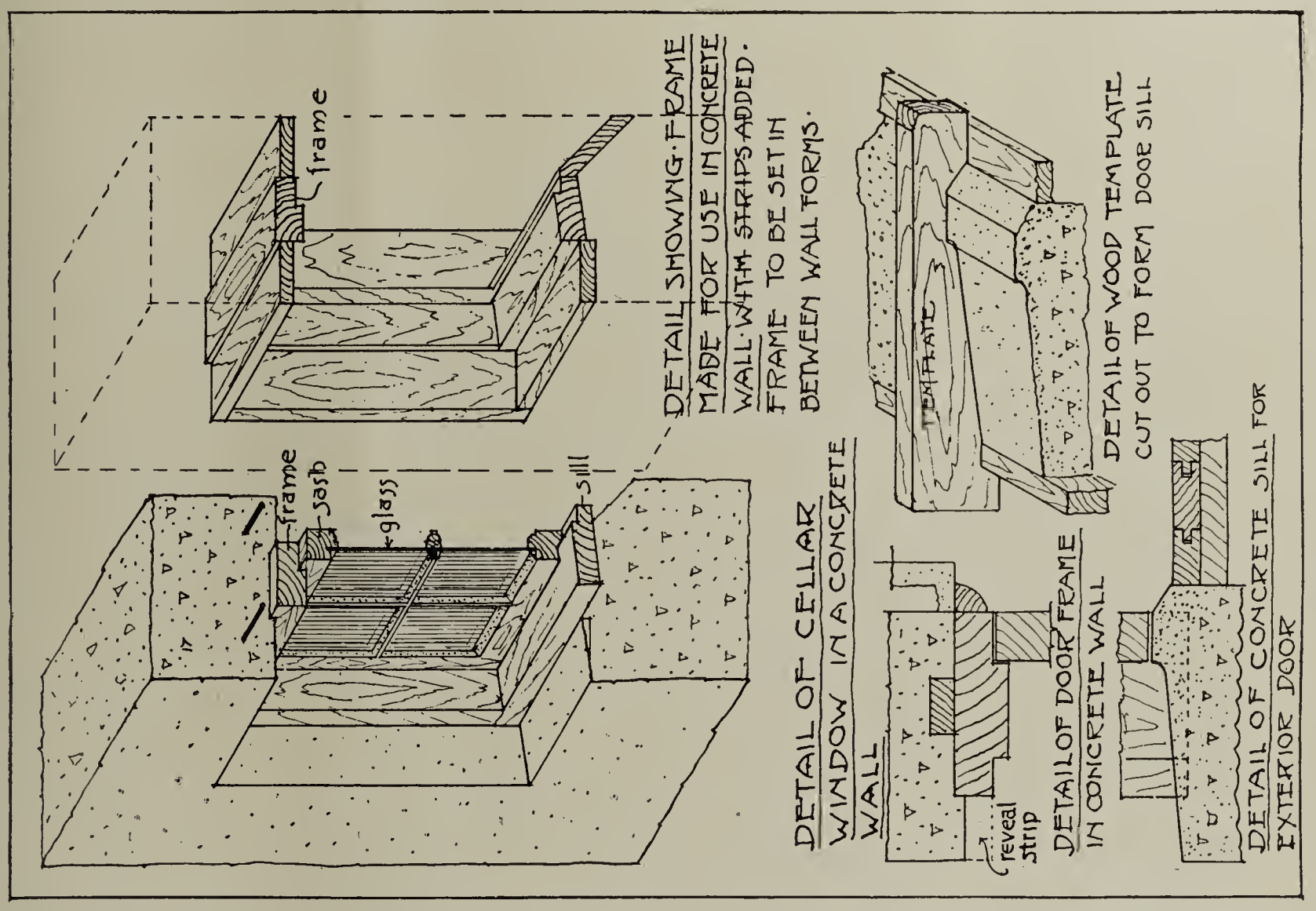



Plate III. The Lower House

# *New Montana Cement Plant in Operation*

Twelve months' work was sufficient to complete the $1,000,000 plant of the Three Forks Portland Cement Company at Hanover, seven miles from Lewistown, Mont., and the big concern is now turning out cement. The completion of this mammoth plant marks the beginning of the development of a great industry in Fergus county which will prove a great factor in building up Lewistown and increasing the number of permanent payrolls in this county.

E. Posselt, consulting and chief engineer for the Cement Securities Co., Denver, Colo. (who operates cement mills in Denver, Ogden, Utah, Ada, Okla., and Superior, Nebr.), has been in charge of the construction, being assisted by M. F. Fleming, also of Denver. H. C. Loeffler is the new superintendent of the plant and John Oliver assumed his duties as chief chemist several months ago. The little town of Hanover has grown up on the hillside on a formerly barren spot of ground into a thriving little place with a 40-room modern hotel, a village store and postoffice, barber shop and pool hall and nine apartments and some 20 houses. About 150 men will be employed, with a payroll of $20,000 monthly.

After blasting the broken rock is loaded into 6-ton, bottom-dump, steel cars, by three 80-ton steam shovels. Trackage extends along the quarry level to the crushing plant, the cars being drawn by locomotives.

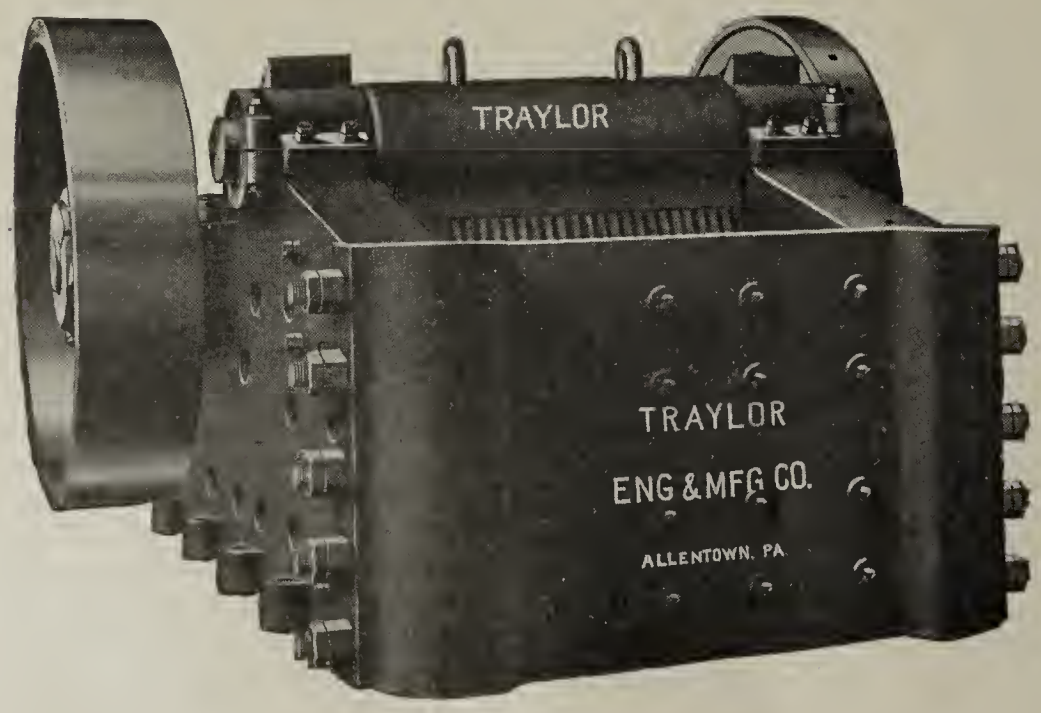
The crushing equipment consists of a No. 9 McCully gyratory crusher, by which 600 to 800 tons of rock is reduced to 2-inch size in 10 hours; there is also a No. 5 crusher of same make. The rock, after passing the large crusher, is elevated and passed through a revolving screen, the oversize from which is recrushed in No. 5. The crushed material is now carried by a conveyor, 150 feet long, to the top of the eight blending bins of 200 tons' capacity each. In the course of this passage to the blending bins the material is sampled by a F. L. Smidth automatic sampler. As each bin is sampled the sample is taken to the laboratory for analysis; the mixture is thus calculated and weighed off on hopper scales in 8,000-pound charges. By this method of sampling the cement mixture is kept the same. The mixture now in the proper proportion is elevated to bins over the rotary drier, the latter being 9 feet diameter and 90 feet long. The drier is fired by producer gas, a plant for which is operated just outside the drier chamber. In passing the material through the drier the moisture is almost completely eliminated. It is next carried by an elevator to bins from which it is fed into four kominuters of F. L. Smidth type, by which it is so pulverized that 70 per cent will pass a 20-mesh screen. As is well known by cement manufacturers, the kominuter is a drum, lined with perforated steel plates, and revolving on a horizontal shaft, and having screens so adjusted as automatically to return the coarse particles to the mill for regrinding. The grinding is effected in the interior of the drum by steel balls which roll and tumble as the drum revolves. The kominuter product is sampled every two hours for mesh-test and chemical analysis. This product is now reground in three tube mills, each 6 by 22 feet, by which it is reduced so that 95 per cent will pass 100 mesh. Each tube is divided into two compartments by placing a perforated plate five feet from the discharge end. The feed-end compartment is provided with pebbles, and small compartment with cylpebs of steel. The tubes run at 25 r. p. m. It is claimed that by this arrangement the efficiency and capacity of the tube mills are increased.

The tube mill product, 95 per cent of which is 100-mesh, is passed by screw conveyor and bucket elevator to the rotary kilns, of which there are three. Each kiln is 9½ feet diameter and 140 feet long, and turns on standard trunnions. The raw material is fed into the upper end of the kiln by a screw conveyor, the mix traveling toward the discharge end. The kilns are fired by powdered coal, reduced to a fineness of nearly 100-mesh by Fuller mills and ball mills. It is fed by short screw conveyors to pipes through which it is blown into the kilns by air pressure supplied by fans, one for each kiln. As the cement material passes into the heat zone produced by the combustion of coal dust in the lower section of the kiln, the carbonic acid is driven off and the lime carbonate is changed to lime silicates and aluminates. The kiln product is in the form of white hot clinkers, constituting portland cement so far as chemical composition is concerned; but to put this in commercial form it has to be pulverized to a fine powder. The first process, after discharging the white hot clinker from the kilns, is to elevate it by McCaslin conveyors to two rotary coolers, operating by natural draft. It passes thence by belt conveyor to two other kominuters and three sets of tube mills for the final grinding, whereby it is reduced to a fineness, such that 85 per cent will pass 200-mesh, and 98 per cent of it will pass 100-mesh. The product is next transferred by elevators and belt conveyors to the stock room, having 40,000 barrels' capacity. It is now moved in similar manner to the packing hoppers from which it is packed by Bates bag valve machines.

The whole process, from quarry to sacking the cement, is entirely automatic, there being no handling at any stage.

The analysis of the finished product is as follows: Silica, 24%; calcium oxide, 63.11%; iron and alumina, 7.90%; sulphuric anhydride, 1.61%; magnesium oxide, 1.75%; ignition loss, 1.21%.

During the process of final grinding of the cement




Traylor Type "C" preliminary crusher installed in the rock crushing department of the Three Forks Portland Cement Co. This crusher is set on top of concrete receiving bins. The crusher is built sectional, so that it can be more easily handled, is of the "Box Type" frame and the vertical joints, both at the front and back are carefully machined and the whole crusher is held together by four extra heavy bolts in the front, and three on the back. This crusher is of extremely heavy design and is particularly well adapted to the handling of large quantities of rock and owing to the water-cooling of the pitman, it is possible to run them at a slightly higher speed than was formerly the custom with crushers of this size. This, of course, gives a slightly larger capacity. The rock is thus reduced to 6-inch size, and from these receiving bins it is carried by aerial tramway to the recrushing plant at the mill.

clinkers there is added 2 to 3 per cent gypsum to regulate the setting of the cement. This material is obtained at the company's gypsum quarries in Jefferson canyon.

In addition to the regular blending bins, previously described, there are two circular, concrete tanks, 1,200 tons' capacity each, for storage of crushed rock. The main plant buildings are of steel frame, enclosed with corrugated iron sheets; the stockhouse, office and laboratory, however, are of reinforced concrete.

In the crushing department, the two crushers, revolving screen and elevator are driven by a 200-h. p. Westinghouse motor. All grinding units, rotary kilns, conveyors and other elevators are each driven by individual Westinghouse motor. The tube mill motors are 200-h. p. each; those driving the kominuters are 60-h. p. each; the kiln motors are each 50-h. p. The power is transmitted from motors to these machines by Lenix drives. Power is purchased from Montana Power Co. The Vulcan Iron Works, Wilkes-Barre, Pa., furnished the rotary kilns.

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## Aerial Tramway, Suspension Bridge and Incline Used at the Plant of the Lehigh Portland Cement Co.

While it is generally known that the uses of Wire Rope are many, it is not often that one company employs it in so many widely separated ways as is shown in the illustration on this page.

By a casual study of the illustration it can readily be seen that there is an active wire rope tramway, a wire rope suspension bridge, and a wire rope incline leading from the river to the plant.

This view shows the plant of the Lehigh Portland Cement Co. (formerly the Chicago Portland Cement Co.) at Oglesby, Ill.

The suspension bridge is 240 ft. between towers, and it has 2 in. cables and ⅞-in. diameter Ernst patent hanger rods. It was erected in 1905.

The tramway illustrated was installed about thirteen years ago, and it has been in practically continuous operation since. It is used to carry rock from the quarry to the mills, a distance of 1,200 ft. Several times has its capacity been increased, this being accomplished at first by adding more buckets, and later by putting on larger buckets and ropes.

At present about 90 tons of rock are transported every hour. There are thirty buckets on the line, each having a capacity of 10 cu. ft.

The grade is wholly against the loads, so that power is applied at the discharge terminal in the mill building. In order to provide permanency to the installation, all towers are built of structural steel. Many of them are quite high, the tallest supporting the track about 80 ft. above the ground.

The problem that this Leschen Wire Rope Tramway solves for the company is similar to what confronts many manufacturing concerns.

# *Electric Operation Permits Economical Gravel Plant Layout*

One Man Handles Excavation by Dragline Cableway—Gravity Used to Advantage in Screening Plant

By E. Earl Glass

Electric operation and automatic control simplify the labor problem at a gravel plant recently completed in southern California. The entire plant, including the excavating cableway, is equipped with electric motor drive. One man controls every digging operation, even including the shift of the free end of the 1,200-foot cableway by a motor located on the far side of the river. Full advantage is taken of gravity in the layout of the screening plant, for after the initial lift on the inclined railway from crusher to screens there is only a single 20-foot elevator required to complete screening operation.

The San Gabriel River, near Los Angeles, on which this new crusher plant of the Southern California Rock and Gravel Company is located, is a torrential stream, and though it is dry at this point the greater part of the year, it has carried down debris with the spring floods until it has built up a great delta of granite cobbles, gravel and sand extending far into the valley from the mouth of this mountainous canyon. These materials are excellent for building, concrete and road work and there is a good market for the gravel and broken stone. Most of the local crusher output goes into the construction of roads.

The plant is on the west bank of the river, two miles below the mouth of the canyon and between two bridges. A four cubic yard dragline bucket is operated from a high-line of two 2-inch cables 1,200 feet long, pivoted over sheaves on top of the crusher tower, to swing the length of the opposite bank between the two bridges. This gives a sector of about 600 feet arc and 1,200 feet radius as the first pit area. As the gravel extends to a great depth, it is expected that this area will maintain the plant, with the annual renewal by the spring floods washing the pit full of stone from up stream. As the heavy floods last only a week or two, the water will hardly interfere with operation of the plant.

If this area should not prove sufficient, the east end of the cable may be swung south and west to excavate the full radius south of the screening plant.

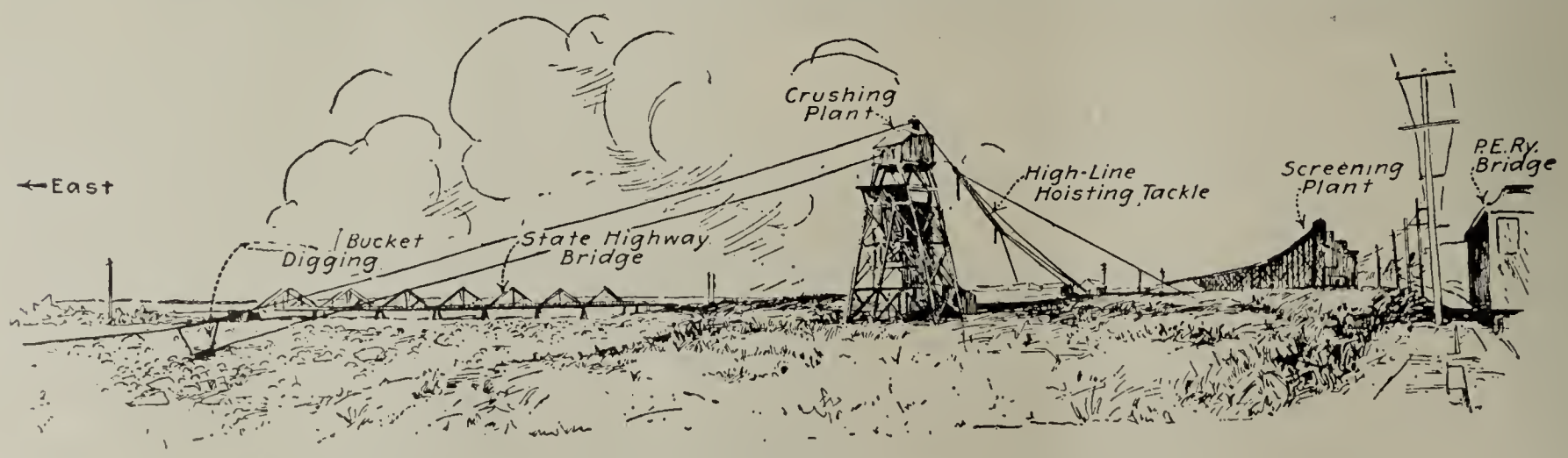
The hoist room is 25 feet square with a reinforced concrete floor slab on a bridge turntable. By an eccentric pull with a hoist cable, the entire building is swung to maintain a position normal to the main cables. In this room is a 300 horsepower motor-driven hoisting drum with pneumatically operated clutch and brakes, and on this is the 1¼-inch drag-line cable. Beside it is a 100 horsepower motor and winding drum for elevating the high line cables by the tackle west of the tower. These motors are operated through automatic switchboards by controllers on the operator's deck above them. There is also a controller for the motor housed across the river for swinging the free end of the high line up or down stream. This gives a one-man control for all the excavating operations.

The bucket dumps upon a grizzly of railroad rails, into a 1,000-ton ore bin with a bottom discharge closed by balanced knee frames. This chute has a grating of 2-inch bars spaced 9 inches apart, the oversize going into a No. 12 Gates gyratory crusher and the undersize going with the crushed stone to a concrete slab on the ground. This is the roof of a concrete tunnel which is the loading room for the cars at the foot of the inclined tramway. The car loading gate is air-controlled.

The large crusher is operated by a 175 horsepower motor housed beside it. On the same level of this tower is the compressor room with a 75 horsepower motor driving a compound 10x12 inch compressor. A 75 horsepower motor-driven hoist at the head of the screening plant tower lifts the two 5-yard dump cars on the inclined trestle to the hopper of a 5-inch and 2-inch concentric revolving screen. The oversize from the screen drops to a No. 5 Gates gyratory crusher driven by a 40 horsepower motor; the 5-inch to 2-inch material passing into a 48-inch Symons disc crusher, the two screenings being chuted to the discharge of this disc crusher. A 75 horsepower motor drives the disc crusher and revolving screen. The gyratory crushers have been fitted with ½-inch pipe to the gear and pinion from an elevated barrel of lubricating oil. The drip is caught and used again. This gives a simple sight feed system which dispenses with the daily lubricating with grease and is much more effective. The opposed pulleys of the disc crushers are diven by back gearing from the countershaft, which is an improvement on the twisted belts commonly used.

On the deck below this crushing floor are two shaking screens, one wet and one dry. The stone from the No. 5 gyratory crusher drops to the dry screen, which is made up of four screens 3 feet wide by 20 feet long with 3-inch, 1½-inch and ⅞-inch perforated sheets over a 4-mesh wire screen. The wet screen is similar to this but the sizes are 2-inch, 1-inch and ¼-inch perforated sheets and 8-mesh wire screens. A 3-inch pipe branches to two 2-inch parallel pipes 17 feet long over the washing screen. Each of these pipes has two rows of ½-inch holes drilled 6 inches apart on the under side.

The sized stone drops through chutes to the proper bin and the oversize from the screens can be lifted by an elevator to a 36-inch Symons Disc crusher, from which it returns to the dry screen. Both this crusher and the elevator are driven by a 50 horsepower motor. It may be noted that this 20-foot lift is the only elevator on the job. The fines from the wet screen fall in a settling tank with




**Gravel Plant Is Located So That Pit Will Be Refilled with Material Yearly by Floods. The Crushing Department Has Two Gates Gyratorys and Two Symons Disc Crushers**

a sloping bottom, up which they are carried and drained by a screw conveyor and are dropped into their bin. A 30 horsepower motor drives the two screen sets and the screw conveyor.

The 2,000-ton track bins have 12 compartments over two tracks and the ground north of the plant is to be used for storage, the chutes discharging over the track bins to a pile beside the plant and a 40-foot electric crane swinging the stone to stock piles. The yards are well supplied with tracks for switching and car storage and the plant is on both the Southern Pacific and Pacific Electric railroads.

A 16-inch cased well was drilled, getting water at a depth of 125 feet. It is fitted with an 8-inch pump and 25 horsepower motor, lifting to a 25,000-gallon concrete reservoir. A 25 horsepower motor direct connected to a 6-inch centrifugal pump boosts 675 gallons per minute (rated capacity) to a 2,000-gallon tank above the washing screen.

The towers are each 125 feet high and are 1,200 feet apart, making the plant half a mile long over all. This was partly to remove the screening plant from the low river bank, and where there was possibility of washout, and to obtain a generous switching yard.

The builders rate the capacity of the plant at 2,000 tons per 10-hour day. As part of the equipment was transferred from a former property to the same company at Acton, Calif., no definite cost can be given; but the complete plant represents an investment of about $500,000.

H. G. Feraud is president of the Southern California Rock and Gravel Co.

## A New Line of Bearings that Insure Longer Life, Increased Operating Efficiency and Economy.

Users of transmission, elevating and conveying machinery, and pulverizers and crushers, will be interested to know that many of the largest manufacturers throughout the country are now furnishing their standard bearings with the famous Randall Graphite sheet lubricator, which is rapidly being adopted by manufacturers and managers of industrial plants in all lines of business, with most excellent results.

All men who are familiar with bearing troubles, as well as the highest engineering and mechanical authorities, concede that graphite is the best existing lubricant, but up to the present time the difficulty has been to combine graphite and babbitt metal.

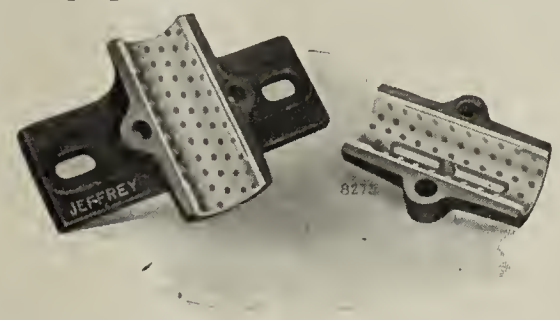
This problem, however, has now been solved to the satisfaction of the most exacting, by a simple patented mechanical device consisting of solidified pure graphite cones, slightly tapered and attached by hydraulic pressure to a fine copper wire screen or fabric. The babbitt metal is poured in the usual way and sets around the cones, making them part of the bearing, which is thus made practically self-lubricating, and eliminating all friction.

The experience of many users is that not a single hot box has ever occurred where the Randall graphite sheet lubricator has been properly installed.

The use of oil with Randall bearings may be, and often is, entirely eliminated. In no case does it amount to more than 10 to 25% of the usual consumption of oil or greases—a saving that would run into large figures in any shop or factory having a considerable equipment of machinery.

This lubricating device will enable Randall babbitted bearings to stand up under heavy pressure and high speeds without heating, assuring an appreciable increase in operating efficiency with a substantial saving in operating cost.

In addition to the economies of oil, babbitt metal, time and labor, the slight amount of oil required for bearings so equipped overcomes all oil-soaking in the




belt, and the saturating of the machinery with oil is also avoided.

The Randall Graphite Sheet Lubricator Company, have recently issued a new Bulletin fully illustrating and describing their graphite sheet lubricator bearings, a free copy of which may be obtained by writing to their home office, 816 W. Lake St., Chicago, Ill.

## Jeffrey Storage Battery Locomotives

Catalog No. 231 of the Jeffrey Mfg. Co. of Columbus, Ohio, describes and illustrates Industrial Storage Battery Locomotives.

Labor is scarce, making it necessary to increase the output per man. The Jeffrey Storage Battery Locomotive accomplishes this. One man and a locomotive will do the work of many hand truckers and will handle goods quicker, cheaper and with less trouble and supervision.

The frames of these locomotives are constructed of structural steel, reinforced with cast steel journal pedestals. Either Edison or Exide types of storage batteries are regularly used; other types when specified by the users.

Their rugged construction and design insure low upkeep for industrial haulage. Safety in operation is assured with operator seated inside of bumper.

Danger of fire risk is less than with any other form of locomotive haulage. Fire underwriters approve this method of haulage.

The advantages offered by Jeffrey Storage Battery Locomotives are many. They are simple to operate—there is no smoke or fumes when the battery comes into the plant. No fire risk. Consume power only when working. They are ready for immediate service at any time of the day or night.

The flexibility of the storage battery haulage system—its ready adaptability to practically every need—its great efficiency and economic possibilities are features that give it a place of paramount interest in the industrial world today.

## Cement Company Builds Concrete Road for Motor Haulage

The Universal Portland Cement Company recently completed 3,700 ft. of concrete road connecting its plant at Buffington, Ind., with Pennsylvania avenue, leading into Indiana Harbor, and also nearly 9,500 ft. of concrete pavement within its plant. This will permit shipping cement by motor truck from Buffington to Indiana Harbor, East Chicago, Gary, Hammond, Whiting and South Chicago. The industries of the Calumet district, many of which are working on government orders, will be supplied with cement, regardless of railroad conditions.

# *Comparative Costs of Motor and Horse Hauling Operations*

By Rollin W. Hutchinson

The following analysis of comparative yardage, hauling capacity, and the equivalent cost of the motor and the animal drawn handling systems, will interest contractors on work requiring the hauling of 5,000 or more yards of loose material. This analysis is based on the experience of road contractors in the States of Ohio, Indiana and West Virginia, and is in no wise a theoretical or mere display of mathematical gymnastics to confound the horse dump truck system of handling road building materials.

Consider 10 teams complete with wagons and harness as representing the equivalent investment of one 7-ton Sterling Dumper—viz., $5,000. Take the case of a contract having 3½ miles of waterbound macadam road to build—a road 16 feet wide and 9 inches deep. This requires the haulage of 8,213 cubic yards of crushed stone. Take the average length of haul for building this road as 2 miles. Consider the teams as owned and teams as hired, $4.00 per day per team. If the contractor owns his teams, his average cost per day for operating them will be made up of the following items:

| | |
|---|---|
| 10 drivers | $15.00 |
| Feed | 10.00 |
| Shoeing | 2.50 |
| Interest on investment | 1.00 |
| Natural depreciation | 3.50 |
| Repairs | 2.00 |
| Daily cost of 10 teams | $34.00 |

The teams average five trips each per day, hauling an average of 2 yards per trip. Total haulage per day per team, 10 yards; for 10 teams, 100 yards. Dividing 100 yards into $34.00 gives a cost of 34 cents per yard. If the teams are hired, the aggregate rental cost would be $40.00 per day or 40 cents per yard.

### Operating Cost of Heavy-Duty Dumper

Considering the cost of hauling with a Sterling dumper we find this to be an average of $17 per day, made up of the following items:

| | |
|---|---|
| Interest on investment | $ 1.00 |
| Natural depreciation | 3.50 |
| Driver | 3.00 |
| Gasoline | 3.00 |
| Oil | .50 |
| Repairs | 2.00 |
| Tire wear | 4.00 |
| Daily operating cost on 50 mile per day schedule | $17.00 |

For the same 2-mile haul, carrying 5 yards per load, the Sterling dumper will make 2 round trips per hour, hauling 100 yards in 10 hours at a cost of 17 cents per yard, or just half the cost for the same amount of material handled with teams owned, and approximately 60 per cent less than the cost with rented teams. On a 3½ mile contract, a contractor, by using the dumper, would save on handling 8,213 yards the sum of $1,396 (8,213 × $17 = $1,396) on the basis of owning his teams, and would save $1,889 (8,213 × $23 = $1,889) on the basis of hiring his teams.

The dumper would thus save over the teams that are owned by the contractor $17 per day, and over the hired teams $23 per day.

### Figuring Cost of Lost Time

Figuring that both systems will handle 100 yards per day as an average, it will take approximately 82 days to deliver this material without allowing for any lost time whatever. One can conservatively estimate to 18 days of lost time, which would require 100 days to complete the job. These 18 days would be an inactive period, but it would be necessary in either case, using a motor truck or horse teams, for the contractor to keep his organization together. Whether working or idling, the maintenance cost of the teams is the same. Consequently 18 days of idle teams would cost the contractors in maintenance alone $612 (18 days at $34 per day).

Fleet of Acme Motor Trucks Owned by the Thayer-Griffith Co., Boston

Comparing the maintenance cost of the truck for 18 days of idleness with the maintenance expense of horse haulage:

The only maintenance cost of the truck when idle would be the interest on the investment and the cost of the driver, amounting to $4 per day or $72 for the 18 days, a difference of $540 actual saving in favor of the truck for 18 days of enforced idleness. Adding this figured amount of $612 to the expense of doing his haulage with owned teams, the total amount lost is $1,936 ($1,396 + $540 = $1,936).

### Night Work Also

The above conservative figures are based upon a contractor requiring 100 days to complete the contract. Even if he owns his teams he cannot haul the amount of material demanded in less than 82 days. With truck, he can do the same work in one-half the time, due to the fact that he can work nights to a greater advantage with the truck than he can during the daylight hours **because traffic is off the highways at night**

**and a truck can be run at night at a higher average speed.** Hence, he can very likely save a portion of the 18 days we have estimated as lost. Contractors have advised me that they have been able to make up from 10 to 50 per cent of enforced idleness due to the advantages of operating the truck at night.

### Maintenance During Inactivity

We can conservatively figure on 100 days of inactivity of the contractor during the winter months. Consider the cost of taking care of 10 teams during the winter months; and the contractor certainly must do this because he can't sell any of his horses at a loss when the demand is slack and buy them again in the spring when the demand is active on a rising market.

The winter cost of keeping ten horse teams amount to an average of $14.75 per day, made up of the following items:

| | |
|---|---|
| Interest on investment | $ 1.00 |
| Daily cost of feeding | 10.00 |
| 2 hostlers | 5.00 |
| Shoeing | 1.25 |
| Stabling | 1.00 |
| Total upkeep per day for 10 teams | $14.75 |

The cost of maintaining a truck during the winter:

| | |
|---|---|
| Interest on investment | $1.00 per day |
| Garage storage | .50 per day |
| | $1.50 per day |
| Total cost of maintaining 10 teams 100 days | $1,475.00 |
| Total cost of maintaining truck 100 days | 150.00 |
| Total saving in maintenance of truck | $1,325.00 |

Horse teams, therefore, during the actual idle period of 100 days consume $1,325, which is approximately 25 per cent of the investment outlay, figuring this at $5,000. Assuming the useful life of the teams to be 4 years, the total loss a contractor incurs from his horse haulage system amounts to $4 \times \$1{,}325 = \$5{,}300$ for merely maintaining them during the winter months. In other words, he pays the investment outlay twice as an essential insurance for keeping together his physical organization.

The bigger the contractor's operations—and necessarily the bigger the amount of his horse equipment—the bigger the proportionate loss. For example: Suppose the same contractor has two 3½ mile road jobs and operates 20 teams on this basis, the loss by owning the teams, on the two contracts, would be twice $1,936, or $3,872. But this is not all. The contractor has an additional loss of 100 days during the winter months for the other 10 team units, of $2,650.

## "Cementile" and Its Merits

An attractive, illustrated folder relating to its product has been issued by the Roanoke Art Tile Corporation of Roanoke, Va. This tile, which is described as "the perfect roof," is known as "Cementile," and the pictures represent buildings of various kinds whose roofs are made of it. The tiles are made by means of the process of the Cottam patent, and it is claimed that they are efficient, elastic in construction, fireproof and economical, besides being of artistic appearance. This kind of tiling has been, it is stated, employed in Europe as a standard roofing for about 75 years, but this company has made it applicable to American types of architecture. It is used for railroad stations, farm buildings and other large structures, as well as for dwellings of all dimensions.

## The Disappearance of Wall Paper

In the last few years the art of interior decoration has undergone great changes. With the advancement in home sanitation and improved housing conditions there has developed an increasing demand for more artistic and harmonious effects and at the same time more sanitary conditions in the decoration of the home. As a result, the use of wall paper has been steadily decreasing and discriminating home builders have turned more and more to the use of the new and artistic flat wall paints for purposes of interior decoration. The beautiful effects which they produce and their sanitary qualities have given them a popularity which stamps them as the wall covering of the future. Knowing the unsuitability of wall paper for purposes of home decoration, both from an artistic and sanitary standpoint, its passing from popular favor can be viewed only with the greatest satisfaction.

Interior decorators have long contended that for the most artistic results a flat painted background was far superior to that produced by the most expensive papers. Its rich, velvet-like texture is unmarred by laps or lines. Its complete lack of inharmonious patterns and clashing colors gives it the true artistic quality of displaying to the best possible advantage every detail of the furnishings. There is something about the flat painted interior with its warm colorings and blending tones that creates an atmosphere of refined elegance unattainable in any other way.

The flat wall paints now obtainable afford immense variety of shades and tints from which to choose. Delicate French grays, light buffs, cream tints and ivory whites for the bedrooms, rich browns, blues and greens for the dining-room and living-room, provide an almost endless variety of pleasing combinations to harmonize with any desired color scheme. On the border or on the body of the walls attractive stencil designs, which bring out in relief the color combinations, may be applied. With them can be produced many effects unobtainable with wall papers. The use of flat wall paints is not limited to new work, but is equally as effective on old unpapered surfaces or those from which old paper has been scraped.

Aside from its inartistic qualities, undoubtedly the principal reason for the decreasing use of wall papers is the growing realization of their insanitary characteristics. There is, in fact, abundant evidence that wall papers are a distinct menace to health. The bacilli of infectious and epidemic diseases find a ready culture medium in the porous, absorbent surface of wall paper and in its backing of organic paste proof surface which permits of washing and is impervious to dampness and resists decay. On their hard, non-absorbent surface there is not the slightest foothold for dust or germs. Through the use of flat wall paints for interior decoration every surface in the home—floors, walls and ceilings—may be fully exposed to the purifying effects of light, air and sunshine. For kitchens and baths sanitary gloss paint is preferable, as it is even more easily cleaned.

## Cement Co. Boosts Wages

Employes of the Marquette Cement Company are to receive a 10 per cent increase in wages, according to an announcement given out by E. J. Dalton, secretary of the company. It was a horizontal increase, affecting all men employed in the plant.

At the same time it was announced that the Marquette Company will contribute to the Patriots Fund an amount equal to the annual subscriptions of all its workers in La Salle and Oglesby.

# Production of Lime in 1917

The estimated production of lime made and sold in 1917 in the United States, including Porto Rico and Hawaii, was 3,663,818 short tons, a decrease of 10 per cent compared with the revised total for the record year, 1916, which was 4,073,433 short tons. It surpassed, however, all records, previous to 1916. This estimate is based on returns made by the principal producers to G. F. Loughlin, of the United States Geological Survey, Department of the Interior.

Of the 42 producing States only 11 reported increased sales. Virginia and Indiana were the only States in the group having sales of more than 100,000 tons to show increase, which amounted to 1 per cent and 3 per cent, respectively. Other states of this group showed decreases ranging from 5 per cent (Pennsylvania) to 36 per cent (Wisconsin). Vermont, with an output of 53,143 tons, showed an increase of 23 per cent.

The following table shows the estimated output of all States that marketed more than 50,000 short tons:

| State. | Total Lime Tons. | Total Lime Per Cent of Change. | Hydrated Lime. Tons. | Hydrated Lime. Per Cent of Change. |
|---|---|---|---|---|
| Pennsylvania | 921,995 | — 5 | 151,253 | + 16 |
| Ohio | 511,687 | — 10 | 332,475 | — 5.5 |
| Virginia | 329,368 | + 1 | (*) | — 5.6 |
| West Virginia | 242,643 | — 10 | 41,390 | — 14 |
| Missouri | 186,024 | — 7 | 28,684 | + 17 |
| Wisconsin | 171,944 | — 36 | 12,800 | — 25 |
| Maryland | 132,644 | — 16 | 24,265 | — 24 |
| Massachusetts | 128,114 | — 12 | (*) | — 35 |
| Indiana | 124,788 | + 3 | 23,993 | + 5.7 |
| Maine | 115,297 | — 33 | (*) | — 11 |
| New York | 105,728 | — 10 | 8,736 | — 20 |
| Tennessee | 100,370 | — 8 | 15,330 | + 4.7 |
| Michigan | 73,432 | — 15 | (*) | + 20 |
| Alabama | 65,971 | — 2 | 7,186 | + 6 |
| Connecticut | 65,327 | — 23 | (*) | + 41 |
| Illinois | 63,476 | — 20 | (*) | + 11.8 |
| Vermont | 53,143 | + 23 | (*) | + 141.5 |
| California | 51,697 | — 9 | (*) | + 9.6 |
| Texas | 51,275 | — 5 | 14,416 | — 1 |
| Other States | 168,895 | ..... | 59,229 | ..... |
| | 3,663,818 | — 10 | 719,757 | + .3 |

*Included in "Other States."

The estimated sale of hydrated lime in 1917 amounted to 719,757 short tons, a slight gain (2,375 tons, or 0.3 per cent) over the sales shown by the revised figures for 1916. This difference is so small that the final figures may not show a gain. This is the first year since statistics of hydrated lime have been collected by the Survey in which there has been no substantial gain in its production. The fact that hydrated lime held its own, however, during a year in which the decrease in the production of lime was so general indicates a relative increase in its use. No companies reporting sales of hydrated lime in 1916 failed to report sales in 1917, and two new hydrating plants reported production, one in Arkansas and one in Idaho. The largest percentages of decrease in the production of hydrated lime shown in the foregoing table were made in States whose product is used lagrely for building.

The price of lime, which generally increased in 1916, continued to rise throughout the country in 1917, though not in proportion to the continued increase in cost of production. A few companies in widely separated parts of the country were obliged to close their plants, partly on account of excessive costs but particularly because of shortage in fuel and labor. These conditions and a shortage of railway cars caused decreased production even where the demand for lime was reported good.

The building lime trade declined in all parts of the country. The unprecedented demand for building lime in 1916 continued until February, 1917, when the effects of the war augmented in some northern districts by severe weather, brought it to a close. A fair to good demand continued in many districts, however, through the spring, and then a general decline in building set in. This decline was due to the uncertainties of war, to increased shortage of labor, fuel, and cars, and to the fact that, lime being perishable, the trade would not order large car lots as demanded by the railroads.

# Locking Cable-Way Carriage for Operating Clam-Shell Buckets on Cable-Ways

Users of cable-ways operating scraper buckets or self-dumping skips loaded by hand oftentimes desire to substitute a self-loading bucket for the scraper, or skips, to extend the usefulness of the cable-way or to eliminate the labor of loading buckets. Sometimes the self-loading bucket will reduce a contractor's force on cable-way work by eight or ten men. In the past it has been necessary in such work to install additional engine drums and lines.

The Blaw locking cable-way carriage has obviated this expense. Its use enables the operator to use standard Blaw clam-shell buckets on any ordinary cable-way designed for hand-filled buckets, without changing the cable-way engine or running additional hoisting or holding lines. This carriage also enables the user to construct a cable-way on which a clam can be operated by an ordinary two-drum non-reversible hoisting engine.

View of Locking Cable-Way Carriage

In the illustration herewith the bucket is shown suspended, in open position, from the cable-way carriage. The carriage itself is locked fast to the supporting cable by means of a clutch that is kept in engagement by the spiral compression spring. The bucket may be raised or lowered, closed or opened, without moving the carriage, by pulling or slacking on the appropriate lines.

When it is desired to cause the carriage to move, the bucket is closed and lifted and hung upon a hook pivoted to the carriage frame. The weight of the bucket then operates against the compression spring, releasing the clutch, and the carriage is free to move along the cable. By pulling on either one or other of the hoisting lines the carriage and bucket travel forward and back along the cable-way.

The system is completely automatic, operated by one man, at the hoisting engine.

## Making Profits for the Building Contractor

It is a well known fact that the speed with which cement, sand, gravel, crushed stone and other materials are delivered to building operations is of vital importance to erecting contractors. In figuring building contracts, time is always considered an important factor. The high price of unskilled as well as skilled labor makes idle moments expensive. Many building contracts are also figured on a time basis and the speed and increased efficiency with which materials may be handled at present have saved large sums of money for the contractors.

Every building material dealer in a large city realizes the value of time in connection with the delivery of materials and has found it essential to install a fleet of motor trucks. In most instances, the retailers have found it to their own advantage to purchase this modern delivery equipment; in other cases the investment has been made for the benefit of the trade catered to by the retailer. The motor truck can be identified as an invaluable part of the building material business. Very few dealers operating in anything but small towns have not purchased one or more of these trucks.

Very often on big jobs, special devices for loading and unloading have been constructed to facilitate the operation of the trucks and a striking example of this is the use of a fleet of nine power-dumping trucks owned by the Cleveland Builders' Supply Co. on the construction of the new $500,000 building for the Richman Bros. Co., Cleveland, Ohio.

The structural work of this building is largely concrete and many tons of sand, cement and gravel are mixed daily. In order to do this work as speedily as possible, the contractors have built a platform of heavy wooden beams on a level with the second story of the structure. Leading up to this platform there are two inclines built of heavy planks with a grade of about 10 per cent. The White trucks with their five-ton load are driven up the incline on one side of the platform. The loads are dumped through an aperture in the platform and the trucks driven across the platform and down the incline on the other side.

In this way trucks are kept running continuously and no time is lost in backing and maneuvering around to find the most advantageous place for dumping. Contractors have highly praised the platform device and say that it saved a great deal of time and money.

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## Ohio Sand & Gravel Producers Organize

Forty of the largest producers in the state completed the organization of the Ohio Sand and Gravel Producers' Association. Plans were made for the elimination of trade abuses and for a closer watch upon the credits of the members. Co-operation for the joint benefit of producer and consumer is the object sought by the organization. Officers elected are: President, F. D. Coppock, president the Greenville Gravel Company, Greenville; vice president, R. E. Doville, Lake Sand and Gravel Company, Toledo; secretary-treasurer, E. S. Warner, Akron Gravel and Sand Company, Akron; executive committee, E. A. Evans, Zanesville Washed Sand and Gravel Company, Zanesville; J. T. Adams, Concrete Materials Company, Columbus; J. M. Truby, Peele Island Sand and Gravel Company, Cleveland; Frank J. Teejan, Wiggam Crushed Stone and Sand Company, Germantown; executive secretary, Guy C. Baker, general counsel, the Greenville Gravel Company, Greenville.

## Concrete Paving Blocks

Dear Sir:

I have been experimenting with a device, and have completed same, with which I can make paving blocks for roads, driveways, sidewalks, barn-yards, floors, etc.

The device is not heavy, can be carried anywhere, and can be operated at home or out in the country, right at the job, by inexperienced help. There is no waste of material; every pound of cement, sand, gravel or stone goes right into the product.

It is just the thing for the farmer to have.

At spare time, in winter or rainy days, the blocks can be made about the place wherever anyone may reside, and at a convenient day, they can be laid (reinforced if desired as provisions are made for that), making one of the most permanent roads, floors or walks you ever could think of.

It is not my desire to sell these machines but to lease them at a fixed royalty.

I have laid floors, sidewalks and roads right here in Bridgeport, Conn., and recently obtained a contract for 15,000 square yards of flooring and driveways. This shows that it is an established fact and the way I make and use these blocks is taking up very rapidly with the public.

When leasing a machine, I also furnish the lessee with formulæ how to use the materials to the best of advantage to get the most efficiency and best results at the least possible cost of construction and production.—Frank E. Clark, Mgr., The Bridgeport Stone Co., Bridgeport, Conn.

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## Boss Concrete Mixers

A 40-page catalog of the American Cement Machine Co. of Keokuk, Iowa, describes in detail Boss Concrete Mixers, whose principal features are the following:

Shape of drum being narrow and high, together with deep steel scopes or shovels, so fixed in drum that mass is cut up, carried high, then poured nearly straight down to center of drum. Others depend upon several blades, buckets, chutes and contrivances to throw mass from side to side of wide drum. This cannot be done with sticky mortar aggregate.

A great time-saver is big openings in drum, long discharge chute, extending two-thirds way into drum, and every deep shovel or scope acts as a discharge bucket. Entire batch of concrete is discharged in 8 to 15 seconds.

Round corners, fewer, but deep and easy to clean, steel shovels, cut out to allow easy passage of water back of them.

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## Electrical Equipment for Cement Mills

"Electrical Equipment for Cement Mills" is the title of the special publication (or circular No. 7174) just issued by the Westinghouse Electric & Mfg. Company. The pamphlet has an attractive art cover, illustrating the interior of a motor driven cement mill, while numerous photographic reproductions are given throughout the publication, showing the application of motors to various types of machinery employed in cement mills.

Advantages of motor drive for this class of service, and characteristics required by motors to be specially successful, are given briefly.

The publication will be sent to any one interested in this class of service, by application to the nearest Westinghouse district office.

# *Cement Gun in Modern Construction*

Since the "Cement Gun," a scientifically developed apparatus for placing cement and concrete by compressed air, first came into practical use, about 1910 and 1911, it has steadily expanded in the uses to which it can be put for all kinds of construction, repair and protective work that its possibilities today seem only limited by the ingenuity of those using this equipment.

A recent piece of interesting construction work with the "Cement Gun" was in the construction of a number of buildings for the Petroleum Refining Company's new plant at Houston, Texas. An illustration is given of three wooden buildings of which the roof and sides were covered with 1½-inch "Gunite," which not only thoroughly protected the woodwork and added to its strength and permanency, but also rendered the structures fireproof.

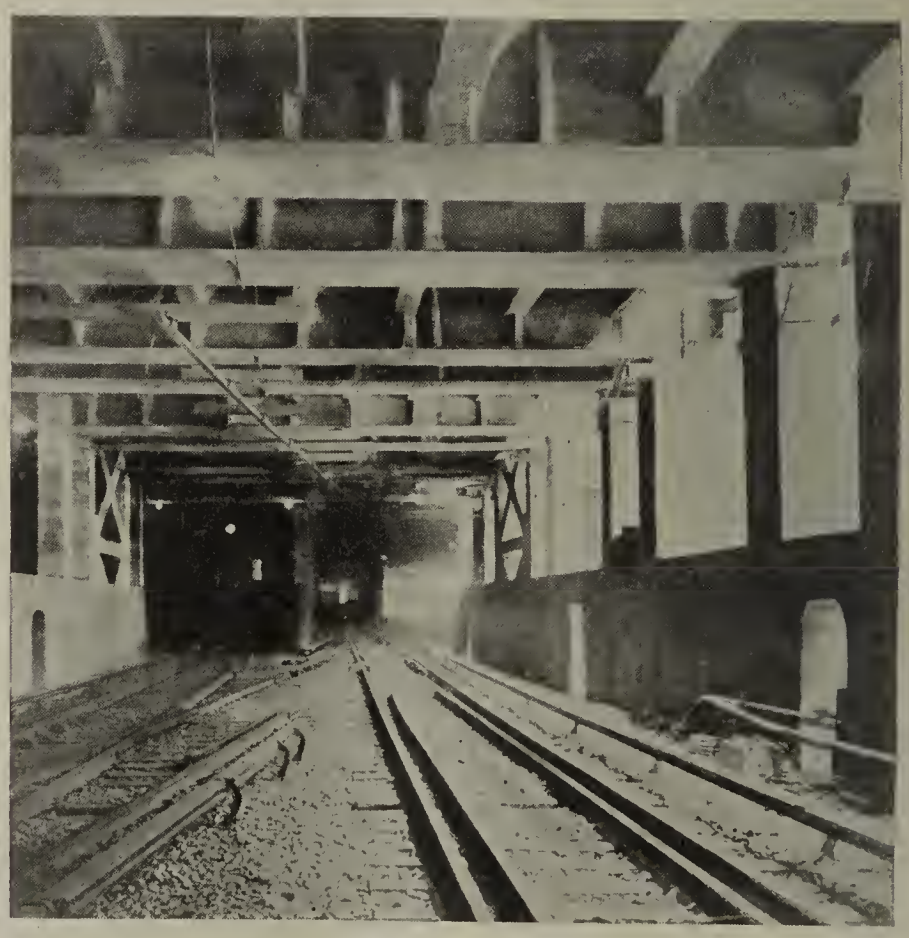
Another late use of special interest at this time has been for the building of all kinds of structures in connection with the country's war work where quick and lasting construction is desired. Prominent among such work is that of building homes for workmen, and an illustration shows a type of four-room cottages built with the "Cement Gun" at Cornwells, Pa., for the Traylor Shipbuilding Co. These homes, as will be seen, are quite neat in exterior appearance, and also have the advantage of being sanitary and of a fireproof character.

Another illustration shows a large heavy steel frame warehouse which has "Gunite" walls two inches thick. This illustration shows several interesting features and stages of "Cement Gun" construction. The walls with the wire mesh attached can be noted, also a section of the wall showing the panels behind the mesh, and a portion of the walls being completed by "Cement Gun" application.

In all classes of railroad structures the "Cement Gun" has found wide adaptability, and a view is given of some steel work at the Grand Central Depot in New York, where about 5,000,000 square feet of steel work was covered with the use of the "Cement Gun," and this is

**Petroleum Refining Co.'s Building Covered with "Gunite"**

**Steel-Frame Warehouse with "Gunite" Walls—Various Stages of Work Shown**



**Work of Grand Central Depot, New York, Covered with Cement Gun**

characteristic of the use of the "Cement Gun" by railroads in all parts of the country for coating steel structures and bridges of all kinds. They have also used this method for lining tunnels and protecting the walls of cuts from water seepage, and in all of this work it is claimed the results have proven of value in protecting the steel work and adding to its life and also remedying many troublesome defects.

For lining canals, irrigation ditches and strengthening levees, the "Cement Gun" has also been successfully employed. A view is given of an irrigation ditch showing wire mesh reinforcement in place and the "Gunite" being applied.

These several illustrations point to a number of instances that indicate the possibilities of "Cement Gun" work, but there are many other classes of construction in which it has also been used with success. Especially is this true for use in mines where the "Cement Gun" has been used for coated roofs and sides of entries, and shafts, giving a protection against injurious effects of moistures and gases. Mine timbers have also been protected against fire and decay by a coating of "Gunite."

One of the new uses for the "Cement Gun" has been in shipbuilding work for lining the hulls of ships, and it is now being used for the direct construction of ships. It is also available for repairing concrete roads and highway structures, and for this purpose "Cement Gun" equipment mounted on automobile trucks are used for making repairs at any place on the roads. This automobile equipment has also been found adaptable for many other types of work where it is necessary to quickly remove the equipment from one place to another, especially for small jobs requiring quick, permanent construction or repair.

These references cover some of the uses to which the "Cement Gun" has been applied successfully, and the range of its work, as previously stated, is limited only by the ingenuity of engineers employing it. This is shown by various references. The American Zinc Company at Mascot, Tenn., had badly leaking fissures in its mine, which threatened to flood the mine. With the "Cement Gun" these fissures were sealed and the trouble averted. The Solvay Process Co. was having much trouble with its acid tanks, and this was remedied with the use of

**Four-Room "Gunite" Cottages at Shipbuilding Plant**

the "Cement Gun." The oil and asphalt tanks of the Atlanta Refining Co. were protected from going to pieces by the use of the "Cement Gun." The Commonwealth Edison Company of Chicago found it necessary to replace its steel coal hoppers every two years, but since using "Gunite" no steel repairs have been made in over two years. The Dewey Cement Gun Co. of Chicago, a contracting firm, has built large water storage tanks without the use of forms, and these have shown no leakage. The Cement Gun Construction Co., also of Chicago, another contracting firm, which constructed the work referred to at the Petroleum Refining Co. at Houston,

**Lining Irrigation Ditch with Cement Gun**

Texas, has also lined a number of sulphuric acid tanks with "Gunite" with success.

The Cement Gun Co. of Allantown, Pa., manufactures and controls the "Cement Gun" equipment. A number of reliable contracting firms in various parts of the country have arrangements with the parent company for undertaking "Cement Gun" work of every character.

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## Cement Gun Company

Edward De V. Tompkins, M. Am. Soc. C. E., Consulting and Constructing Engineer, who has for the past 7 years had offices in the Professional Building, 17 East 38th St., New York City, has moved to Chicago to take the general agency of the Cement Gun Co., Inc., of Allentown, Pa., in charge of their Midwest Territory, with headquarters in the Fisher Bldg., Chicago, Ill. During the past 25 years Mr. Tompkins has designed and built many important water front developments, including bulkheads, piers, power houses, factory buildings, conveyor systems, etc. He has also executed many contracts of magnitude for the Federal and Municipal Governments, including piers, bridges and sewers. He was Bridge Engineer in Charge of Construction for the City of New York for six years, and during the past administration was Deputy Commissioner of Department of Docks & Ferries of New York City. His previous commercial experience was as manager of the New York office of the Trussed Concrete Steel Co., manager of the Philadelphia office of the Columbian Fireproofing Co., and Manager of the New York Office of the Main Electric Co.

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## La Salle Cement Co. Gives Garden Plots

The La Salle Portland Cement Company, La Salle, Ill., is donating a large tract of land to their employes for gardening purposes. Last year about fifty families had gardens on this tract. All want it again for this year and any additional land that may be suitable for the purpose. It is hoped to provide enough for one hundred families and to give each at least sixteen square rods. This is enough to produce the potatoes and vegetables for the ordinary family for a year.

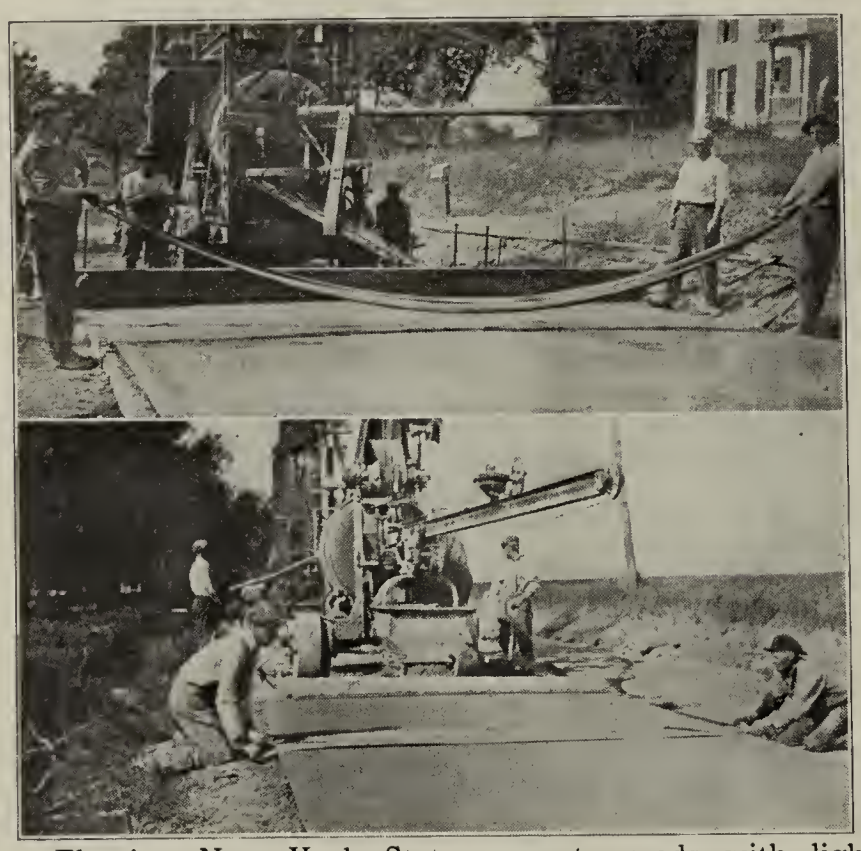
# Light Canvas Strips for Floating Concrete Pavement

By Charles T. Fisher*

During the past construction season a light canvas strip has been employed with good success for floating concrete pavement on several New York state highway contracts in Chautauqua and Cattaraugus counties.

A piece of 10 ounce canvas, about 3 feet longer than the width of the pavement, was folded longitudinally to a width of about 18 inches and used instead of a heavier belt. By folding the canvas rounded edges were obtained which did not dig into the soft concrete.

In some cases the folded edges were left loose, and the ends of the strip rolled up to form handles for the workmen, and in others a more convenient belt was made by



Floating New York State concrete roads with light canvas strip. Upper—Canvas strip used for floating Jamestown-Bemus Point State Highway, Chautauqua Co., N. Y. Lower—Floating with canvas strip on French Creek—Findley Lake County Highway, Chautauqua Co., N. Y.

sewing down the folded edges and attaching wooden cross-pieces at the ends.

The operation of floating did not differ materially from the ordinary "belt method," but the light strips were handled with greater ease and rapidity than heavier belts.

The concrete was struck off with a screed of the usual type immediately after placing, and the surface floated at once with the canvas. Usually it was necessary to go over the pavement twice. On one contract, however, where the aggregates were particularly well graded and the consistency of the mixture very uniform, a single application gave an excellent finish. Floating was usually done by the same men that handled the screed. It was rarely necessary to use a hand float, except where joint strips projected above the surface.

The concrete was in all cases a 1:1.5:3 mix, using crushed stone for coarse aggregate.

### Conditions Requisite to Good Results

For satisfactory results in finishing pavement with the light canvas strip it was found that certain conditions must first be secured. All of these are essential, however, if a smooth surface is to be obtained by any method of finishing.

The forms must be straight and true and must be very carefully set. The top of the form guides the screed which shapes the surface.

The concrete should be fairly dry and of uniform consistency, in order to retain properly the shape given by the screed. A mixture in which the footprints of the workmen remain for several minutes without filling up is about right.

Careful screening is of the greatest importance. If the screed "rides" the concrete, ridges result; if the concrete ahead of the screed is too low, depressions are formed. The canvas float will not smooth out these irregularities.

Provided the above conditions are fulfilled, a smooth and even finish can be easily and rapidly produced with the canvas. Very little mortar is flushed to the surface, rendering the pavement less liable to unsightly scaling under traffic. Time is saved, as except on steep grades and banked curves, where it is better to allow the concrete to become slightly hardened before finishing, the floating may be done immediately after screeding. No skilled labor is required, as the light canvas does not alter the shape left by the screed, and it is only necessary to make sure that it always touches the tops of the forms as it is worked back and forth along the surface.

These canvas strips were first used in this vicinity on the Jamestown-Bemus Point State Highway. Mr. John A. Wallace, assistant engineer, was in charge for the State Highway Department.

*Senior Assistant Engineer, New York Commission of Highway, Jamestown, N. Y.

# Concrete Ship Company Organized

John F. Wallace of Chicago, formerly chief engineer of the Panama canal, is president, and Edwin L. Lobdell, LaSalle street investment banker, is a director of a new shipbuilding enterprise known as the Torcrete Shipbuilding corporation, with office in the Rookery building, Chicago.

"Torcrete" is a reinforced concrete specially prepared for ship construction. Instead of being poured in forms the materials are shot in place by means of compressed air with a tector, a new type of concrete blower. The processes are the invention of Carl Weber, general manager of the project. Mr. Weber was formerly connected with the Weber Concrete Chimney Co. and the Concrete Gun Company of Chicago. The preparation is discharged on layers of steel fabric or wire mesh and there may be as many layers as is necessary to produce the required thickness, the layers themselves massing with one another so as to form a perfect solid.

Presently subsidiary companies will be formed at Atlantic, Pacific and gulf ports and in Canada. A vessel of 3,200 tons displacement has been contracted for by the Southern Oil and Transport corporation.

Charles F. de Ganahl and Charles H. Rathbone, respectively president and vice-president of the Southern Oil and Transport corporation, are directors of the new company. The capitalization is $300,000 7 per cent preferred stock and 9,000 shares of common without par value. The company has been incorporated in Delaware.

# Cement Co. Gives Prize for Smallest Number of Accidents

The Safety Committee of the Lehigh Cement Company's plant at Oglesby, Ill., has just been informed by the head offices of the corporation (Allentown, Pa.) that the Oglesby plant has been awarded a prize of $100 for having had the smallest number of accidents during the past year in any of the company's plants.

The Lehigh Company operates eight cement mills.

## Cement Block Factory

The La Porte City cement works, La Porte City, Iowa, owned and operated by J. W. Stewart, enlarged its output during the past year as a result of having adopted the Zaglemeyer improved pouring system. This system produces a product which should rightly be called cast stone, in that it is a live material which continues to solidify for 14 years after manufacture, making it a most superior building material, says the La Porte City Journal. During the past year the plant has sold 50,000 blocks which were used in the construction of houses, warehouses, garages, and barns. The output of fancy cement work, such as park benches, flower urns, and cemetery fences, has been especially large this year. One of the most complete buildings of cement construction is the barn on the Ed Haymond farm in Spring Creek township, to replace the one destroyed by fire, and is 50x100 feet, built of poured cement blocks, with all modern barn equipment, including ventilating system. This building when completed will be one of the finest barns in the state, and is being constructed from specifications recommended by the Iowa Agricultural college. The hog house on the Lester Chester farm, built entirely of cement blocks, is one of the most modern and well equipped buildings of its kind in this part of the county. There were twenty carloads of these blocks shipped out during the past season, and with the present outlook for an increasing demand for this new block the plant expects to more than double its output during the coming year.

## Metal Moulds for Building Circular Concrete Structures

The Conklin Construction Company, 430 West Main street, Hartford, Mich., manufacturers of metal moulds for reinforced monolithic concrete construction such as silos, coal pockets, standpipes, sand and gravel bins, grain storage, etc., have a new catalog descriptive of their system which will be sent to interested inquirers. This catalog shows the numerous uses to which Conklin equipment may be put and will be of great value to the concrete contractor. This equipment carries its own scaffolding, is automatically raised by two jacks on the center mast and is peculiarly well adapted to the construction of the combined silo and water tank. With this equipment eight feet of wall may be built in a day with four men or a 64-foot silo in eight days. A Conklin silo will not vary from a true circle, even thickness of wall or a true perpendicular.

The Conklin Construction Company proposes to give service to purchasers of their equipment which will enable them to dominate the circular work in their territory. They furnish an experienced man for instruction purposes and a complete outfit of publicity and demonstrative matter which will enable the purchaser to get business from the start.

## Arrowsmith Long Handled Concrete Tools

There are several reasons why the long handled finishing tool has become so popular with contractors. It enables them to cut the cost of their bids because of the reduced labor costs. The makers of this class of tool say that a man can do from six to eight times as much work with a long handled tool as he can with the ordinary kind. This cuts the time that is needed to finish a piece of work with the resulting reduction in cost.

The accompanying illustration shows a combination outfit of long handled tools that is being offered by the

Arrowsmith Concrete Tool Company. One of the great advantages of this outfit is that it is offered at a price considerably lower than the cost of each tool if bought separately.

The handles of all their tools can be adjusted so that they will suit operators of different heights. The handle can be adjusted to any angle with the tool itself and there are no loose joints or cogs to wear and cause trouble.

The edgers and jointers are made in a "rocker" shape so that they will cut through the concrete and give a smooth finish.

This concern is offering to send these tools on ten days' trial and if they are not satisfactory they can be returned. A card addressed to the Arrowsmith Concrete Tool Co., care of CEMENT & ENGINEERING NEWS, 672 Transportation Bldg., Chicago, will bring full particulars of their offer.

### THE NEW PLANT OF THE HUMBOLDT (IA.) SAND & GRAVEL CO.

"The gravel is dug by a clam shell bucket, with a Link-Belt locomotive crane and conveyed to a track hopper in dump cars. A short conveyor equipped with Sawyer stitched canvas belting carries and elevates this material to a stone screen; the oversize is removed and crushed in an Austin-Western Aurora rock crusher; the crushed material is then carried by a second short conveyor, which discharges on the first conveyor, and returns the broken to the stone screen. All material which is reduced to a size to pass the stone screen is carried by the main conveyor to the top of the bins, where it is washed and screened into various sizes suitable for commercial use."

## Reducing Misfire Costs

Many times on a rock job one sees the shovel hung up and doing nothing. On investigation it is found that they have encountered some tight bottom which the shot failed to pull. This means a delay of an hour or more while the obstruction is redrilled and reblasted before the shovel can be advanced and digging resumed. Again a delay of several days may be caused by the discovery that there are missed holes and unexploded powder ahead —naturally the shovel crew is reluctant or refuses to proceed until the danger is removed. Oftentimes the material has to be carefully mucked by hand and all this time the shovel is lying idle. Obviously in order to get the best out of a shovel or dredge continuous steady operation must be maintained. Such delays are very expensive and, if they occur frequently, may even disrupt the whole organization. It is not uncommon to see a dipper dredge bring up unexploded charges. Occasionally these charges explode when hit by the dipper teeth causing considerable damage. Dig deeper holes to bring bottom. Use more care in loading and in testing caps.

It has been proven by actual experience and tests by U. S. Bureau of Mines that it requires more and stronger explosives for submarine rock excavation than in open cut work. To a great extent delays and danger from above causes can be avoided by the proper selection, and care in loading of explosives. Frozen explosives are less sensitive and efficient than when thawed.

In order to get the maximum out of any explosive it is well to use strong detonators.

For rock work before a steam shovel, if work is wet, it is best to use a low freezing gelatin from 40 per cent to 60 per cent strength depending on the character of the material. Present prices of glycerine being high, contractors are finding that good results can be obtained by using lower grade explosives where higher grades were formerly thought necessary. If work is dry, a low freezing dynamite can be used. In tight hard bottom, the gelatin is best suited because in addition to the no-thawing advantage, it combines density with high water-resisting characteristics. Density is an advantage in that more weight of explosive can be concentrated in bottom of any given diameter of bore hole than with lighter dynamites.

For submarine rock blasting a 75 per cent strength of gelatin dynamite is best adapted. Nothing weaker than a No. 8 Electric Blasting Cap should be used with any gelatin.

Stick to the well proven standard explosives for best results. Promiscuous trying out of unproven brands may cause a lot of trouble and expense. It is not difficult to reduce the powder cost per ton or yard of material in almost any operation. The charge per hole can be arbitrarily reduced a pound or two with seemingly equal results; but watch out! The shovel cost and secondary drilling cost may jump up, more than wiping out the apparent saving.

**One of three steam shovels in the Tomkins Cove Stone Company's quarry at Tomkins Cove, N. Y. A Cyclone big blast hole drill is shown in upper left hand corner.**

## A Quarry Car That Is Strong

I wish to cite a principle of quarry car construction that is not known to all quarrymen. The principle is that armored wood will resist impact very much better than steel alone. I would say that two inches of wood covered with ⅛-inch sheet steel will many times outlast ¼-inch sheet steel without this backing, even when the support in each case is the same; other thicknesses of metal in proportion.

At the plant of the Trap Rock Co., at Dresser Junction, Wis., 8-yard cars of this description are used. The floors of the cars are constructed of hardwood planks three or four inches thick, covered with one-quarter inch of metal. They are loaded by a 120-ton steam shovel and frequently pieces are placed on them weighing from ten to twenty tons and they are placed none too gently. After three years of service there is not a battered car floor in the lot, although other parts of the cars were frequently broken from the impact.

The principle is one that could well be applied at other points in a crushing plant. For instance, the

battering of all-metal pan conveyers; even an inch or two of armored wood will give enough resiliency to the backs of these pan conveyors to stop the constant denting.

R. W. SCHERER, Secy.,
Wisconsin Crushed Stone Assn., Milwaukee, Wis.

## U. S. Government Wants Men for Export-Trade Offices

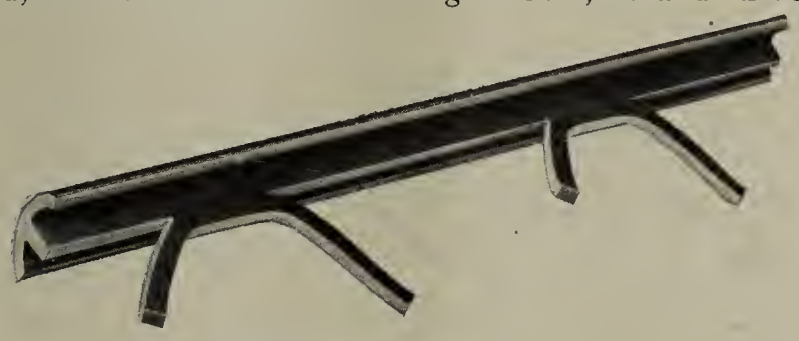
The Government is looking for men capable of taking charge of branch offices of the Bureau of Foreign and Domestic Commerce, Department of Commerce: also men to act as assistants in such offices. These branch offices are located in the principal commercial cities, the salaries ranging from $1,800 to $3,000 for managers and from $1,200 to $1,800 for assistants.

Applicants should write at once to the Bureau of Foreign and Domestic Commerce, at Washington, as a non-competitive examination will be held on May 16 in various parts of the country. Full details will be furnished upon written application to the Bureau.

Applicants will be examined in export-trade technique, promotion of commerce, and economic geography, and credit will be given for knowledge of foreign languages. The examination will be given under the direction of the Civil Service Commission, but communications should be addressed to the Bureau of Foreign and Domestic Commerce.

## A Round Nose Curb Bar

The Havemeyer round nose curb bar, manufactured by the Concrete Steel Co., Monadnock Building, Chicago, is made with an inch radius and weighs 1½ pounds per lineal foot. It is furnished both galvanized or ungalvanized, and is carried in stock lengths of 8, 10 and 12 feet.



Round Nose Curb Bar

The manufacturers of this bar are in position to do most accurate bending. Besides stocking this curb bar in the Company's eleven warehouses, it is stocked throughout the country by various dealers and agents.

The form of anchorage in this bar is perfect, as the anchors are sheared from the web and occur every 6 inches. They extend 2¾ inches into the concrete, and are so flared and staggered as to give an excellent anchorage; especially is this anchorage of the proper type as there is a minimum of material extending into the concrete to split or weaken it, and at the same time offering a minimum of expansion and contraction and allowing no opportunity for the water to lodge and by freezing split the concrete.

Two types of forms are furnished for supporting the bar prior to pouring the concrete. These are a flat metal form and a spring wire support.

## Producing Limestone Fertilizer

Lime crushing machinery has been installed at the New Jersey State Farm at Annandale, Hunterdon County, for production of lime fertilizer. About 15 tons of crushed lime is being turned out a day. The plant is being worked by inmates from the State Reformatory for Boys, at Rahway.

## The Franklin Street Reinforced Concrete Bridge, Waterloo, Iowa

By E. K. Borchard, Engineer, 30 Broad St., New York.

There may be some isolated locations for bridges where beauty should be subordinated to utility, but these are few and never within any municipality or township. In concrete bridges, good appearance may be secured without any sacrifice of utility or low first cost; and this factor makes concrete the first choice for municipal bridges.

Previous to the last two decades there had been little attention devoted to designing and building a bridge that was in harmony with its surroundings and pleasing to the eye. Open trusses and plate girders

View of the Franklin Street Reinforced Concrete Bridge, Waterloo, Iowa

were provided with no effort at ornamentation or good appearance.

Today in concrete bridges even of the very smallest size, some simple ornamentation is provided at practically no increase of cost—in addition to the naturally pleasing look of sturdiness and solidity inherent in concrete construction.

### Concrete Arch Bridges

The arch has admittedly a more substantial look than any other type of bridge superstructure. The large mass of the concrete in an arch absorbs all vibrations from vehicular loads—at the same time the arch provides ample waterway or headroom.

The bridge shown in the illustration shows admirably the possibilities of concrete bridges for highways. This bridge is the Franklin Street Bridge at Waterloo, Iowa. The ornamentation is simple and dignified—yet only possible in concrete without excessive cost. This bridge shows only a moderate effort toward ornamentation; many bridges have been built of concrete in very ornate style.

In the bridge shown the surface of spandrel walls are relieved by a sunk panel, while the arch ring is accentuated by a V-groove. At piers and abutments a very pleasing yet simple treatment is given by breaking what would otherwise be a broad expanse of concrete into ribs to give the effect of three narrow columns.

The balustrade guard rail deserves special notice for the neat balusters of concrete, surmounted by a concrete guard rail. Consider what the cost would be if these balusters and rails were all worked in stone. The guard rail pedestals over every pier and abutment support metal lighting standards, each provided with five electric light globes.

Good appearance is only one of the advantages of such a bridge as this. Low first cost, absence of maintenance costs, resistance to floods and permanence are additional reasons for building of concrete. With this bridge there will be no need for periodic renewal of bridge floor with consequent obstruction to traffic and no heavy expenses for repainting every few years.

# *Reinforced Concrete Factory Building*

Floors are of reinforced concrete of flat slab type. The stairs themselves are reinforced concrete. The contractor introduced a very efficient and economical way of handling the concrete material on this job.

One of the finest manufacturing buildings in the state of New Jersey is the recent addition to the plant of the Sprague Electric works of the General Electric Company. The new building is in Bloomfield, located at the intersection of the D. L. & W. and Erie Railroads, and will provide increased capacity for the manufacture of generators, motors and controllers, dynamometers, hoists, ozonators and electric fans.

This additional building was erected by the John W. Ferguson Co., of Paterson, N. J., and is of reinforced concrete, 75 by 550 ft., with an ell 75 by 175 ft., six stories in height, walls and columns being designed for the addition of another story should it be necessary at some future time.

The entire exterior is veneered with selected red brick, using French gray mortar tinted with black. All points are tooled.

The trimming, consisting of window sills, lintels, belt course, cornice and coping, is of reinforced concrete with rubbed finish.

To provide abundant light for manufacturing purposes and to eliminate dark corners, about 60 per cent of the wall area is devoted to window space, Lupton counterbalanced steel sash being used throughout the building. In addition, the ceilings are painted with mill white flat finish to reflect the light to the best possible advantage.

The artificial lighting is direct, four lights per bay, except in the office, where the semi-indirect system is used.

There are two exterior and three interior stair towers; all of these are shut off with fireproof walls so that abundant provision is made for escape in case of fire. The stairs themselves are reinforced concrete with railing of wrought iron pipe and wire screen. There are five elevators so situated as to facilitate transportation of material from floor to floor with a minimum amount of trucking.

All floors except the first have a wood finish. This consists of coal tar pitch and sand laid direct on the rough slab, on top of which is placed a hemlock planking under-floor. The under-floor on the second, third, fourth, and fifth floors is 3 in. and on the sixth floor 2 in. On top of this was laid selected hard maple finish 1¼ in. thick for the second, third, fourth and fifth floors, and 1 in. thick for the sixth floor. In the hemlock under-floor a series of ducts were formed, both transversely and longitudinally, and through this all electric conduits were run, thus affording easy access and locations. The first floor has a wood block finish.

Floors are of reinforced concrete of flat slab type, designed for floor loads of 250 lb. per square foot live load for the second and third floors, and 200 lb. for the fourth, fifth and sixth. The column space is 25 by 25 ft., columns being kept at a minimum size by the use of maximum reinforcement and a rich mixture.

Washrooms and toilets, located on every floor, represent the most modern factory practice.

A steam vacuum heating system is installed and an abundance of coils are placed under the windows so as to take care of the tremendous heat losses from a building having such a large surface of glass.

In spite of the fireproofness of the building, automatic sprinklers were placed on every floor so that goods in storage or in process of manufacture cannot be destroyed by fire.

On account of congestion on the railroads and the fear of consequent delay in delivery, arrangements were made to bring bulk material to Newark by water from which point it was taken to the building site by motor trucks. Operations were carried on in winter weather which necessitated all concrete materials being heated, the chutes from the central tower to the two distributing towers being enclosed in wood with a steam pipe running through, thus insuring proper heating to the distributing point.

A gravel incline was erected by the Ferguson Company to load to a point just above the mixers at the foot of the main tower. Here the sand and gravel were dumped through a grated floor into separate bins, thence passing to the mixer while the cement was brought to this point by industrial care. This made a very efficient and economical way of handling material, and reduced the unit cost to a minimum.

The plans of the building were prepared by Mr. C. G. Hulth, Supt. of Grounds and Buildings, General Electric Co., with Harris & Richards, Consulting Architects, while the electric light and power system and equipment as well as the heating, ventilating and sprinkler system, were designed by Messrs. Henry C. Meyer, Jr., and Bassett Jones, engineers, in cooperation with the General Electric Company's engineers.

**Reinforced Concrete Factory Building of the Sprague Electric Works**

# Book Review

New Publication: Finding and Stopping Waste in Modern Boiler Rooms, by Engineers of the Harrison Safety Boiler Works. Cloth; 9 inches by 7 inches; 276 pages; 213 illustrations; $1.00. Sent on receipt of price by CEMENT AND ENGINEERING NEWS, Transportation Bldg., Chicago.

The saving of coal is the purpose of this practical handbook, which is addressed to power plant owners, managers, engineers and firemen. The preface states that such statements, tables, charts, etc., have been selected as were supported by experiments and tests, references being given wherever possible to the original authorities. The latter include many well-known engineers and writers in technical periodicals, also authors of papers before engineering societies, while the excellent bulletins on the utilization of fuel issued during recent years by the United States Bureau of Mines have been freely drawn upon. Pains have been taken to compare statements and to check each source of information against others.

The work is divided into five sections, the first of which is about "Fuels," under which are considered the coals of the United States and their classifications, size of coal, coal sampling, proximate analysis, ultimate analysis, heating value of coal, ash and clinker, value of coal for steaming purposes, purchase of coal under specification, washing of coal, storage and weathering of coal, coal measurement, oil fuels and gaseous fuels.

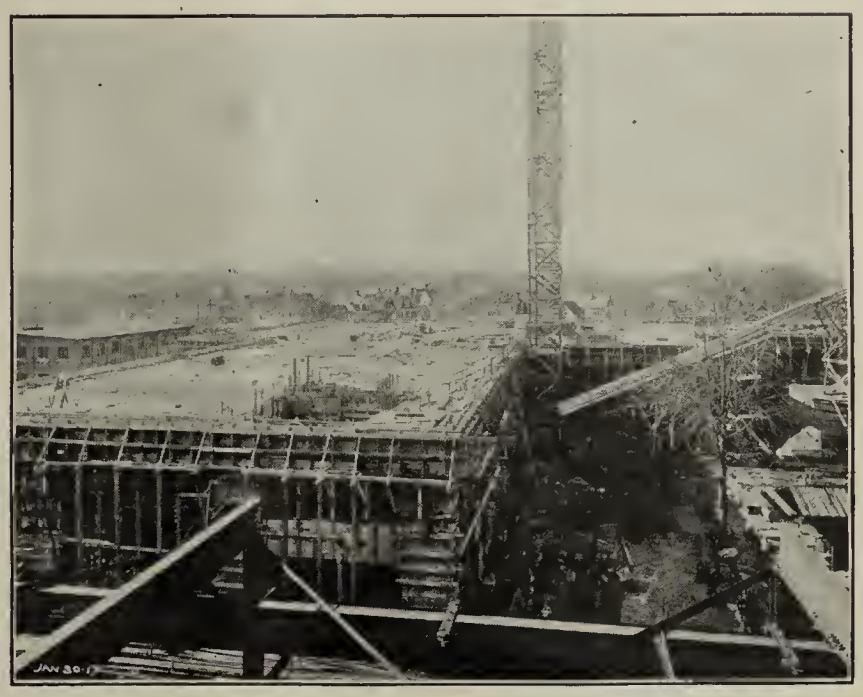
The second section is on "Combustion," taking up the chemistry of combustion, air theoretically required, grates and grate surface, hand firing methods, thickness of fire, mechanical stokers and their operation, furnace temperature, furnace gases, clinker, draft, flue and stack proportions, draft required by stokers, mechanical stokers, draft gages, dampers, flue gas temperatures, flue gas analyses, $CO_2$ recorders, what $CO_2$ indicates, what CO indicates, air requirements and

**Constructing the concrete factory building for Sprague Electric Works. View of distributing towers and chutes.**

supply, preventing excess air, smoke and smoke prevention, burning oil fuel, burning gaseous fuels, and burning powdered coal.

The third section treats of "Heat Absorption," including heat transmission by conduction, convection and radiation, heat transfer from a fluid in a channel, heat transfer in economizers, air heaters and superheaters, improving heat absorption, relation between heating surface and boiler capacity, boiler setting, refractories and fire brick, soot, scale, softening feed water, and feed water heating.

The fourth section on "Boiler Efficiency and Boiler Testing" covers heat balance, heat absorbed by boiler, heat losses due to moisture in the coal, hydrogen, chimney gases, CO, combustible in the ash, moisture in the air, and unaccounted for loss, efficiencies, effi-



**Floors are of reinforced concrete of flat slab type designed for floor loads of 250 lbs. per sq. ft. live load.**

ciencies with different coals, boiler capacity and efficiency, and boiler trials.

The fifth section on "Boiler Plant Proportioning and Management" discusses various arrangements of auxiliaries with regard to their effect upon feed heating, and also describes the Polakov functional system of boiler room management.

The book has been compiled by George H. Gibson, member American Society Mechanical Engineers, assisted by Percy S. Lyon, now captain of Coast Artillery. The proofs were read by Mr. Henry Kreisinger, who conducted for the United States Bureau of Mines many of the investigations quoted in the text.

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# Economy in the Design of Reinforced Concrete Buildings

A paper on "Economy in the Design of Reinforced Concrete Buildings," which was presented before the Boston Society of Civil Engineers by Clayton W. Mayers of the Aberthaw Construction Co., has been reprinted for free distribution. Copies may be obtained by applying to the Aberthaw Construction Co., 27 School St., Boston, Mass. An abstract of this paper was published in the April issue of CEMENT AND ENGINEERING NEWS on page 33.

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# Orders Cement Rates Lowered

The Interstate Commerce Commission today ordered lower rates on shipments of cement in carload lots between points in Indiana, Illinois, Iowa, Missouri, Minnesota, Kansas, Nebraska, Wisconsin, South Dakota, Oklahoma and the Michigan peninsula. Present rates are to be withdrawn and new ones substituted on or before July 8. The commerce commission also tentatively ordered railroads in the Central Freight Association to lower rates from Chicago to points in central and eastern sections of the country, so as to conform with rates on lumber from St. Louis, Cincinnati and Marinette, Wis.

## Machine Unloads Material at 50 Cents a Car

The automatic car unloader shown on this page is said to effect a great saving in cost of handling material. The manufacturer, the Sunbury Manufacturing Company, of Sunbury, Ohio, says it costs only 50 cents to unload a car of material with the Sunbury unloader. The device handles stone, gravel, sand, screenings and other loose material.

The depth of excavation below the rail to install this machine is 20 in. The heavy reciprocating feeder is built entirely of steel. It carries a certain amount of material forward and deposits it on a receiving section. With the next stroke the material previously deposited is moved into the bucket elevator. The manufacturer declares that one man can operate the machine. No belt conveyor, hoisting skip or bucket is employed. A factor of safety of 2 has been used in the design.

## Newago Cement Co. Elects Officers

The Newaygo Portland Cement company, Newaygo, Mich., has decided to establish a plant for recovering potash for fertilizer purposes, it being estimated that two and one-half tons in the form of gas and dust have gone to waste daily.

Officers elected at the annual meeting are: President and treasurer, Clay H. Hollister; vice president, Wilder D. Stevens; vice president and general manager, J. B. John; secretary and assistant treasurer, W. N. Ansorge.

Directors are the officers and Mrs. Daniel McCool, Frederick Vogel, Jr., of Milwaukee, H. D. Higinbotham of Joliet, Jacob Kleinhans and P. B. Garvey.

## Pulverizing Mills Sold

Bradley Pulverizer Co., manufacturers of the Giant Griffin, the Bradley Three-Roll and the Bradley Hercules mills for pulverizing, with main office at 92 State St., Boston, and works at Allentown, Pa., has recently sold mills to plants as follows: Deschambault Quarry Corp., Quebec City, Canada; Becker Limestone Co., Lincoln Park, N. Y., near Rochester; Seminole Phosphate Co., Croom, Fla.; Utah Potash Co., Trenton, N. J.; New Castle Lime & Stone Co., New Castle, Pa., and Rose Point Lime & Stone Co., also at New Castle.

## Government Fixes Price of Cement

The State Highway Board of Missouri is in receipt of information direct from the United States Office of Public Roads to the effect that the government has fixed the prices of cement for use in federal aid road construction. The cement plants at Hannibal, Mo., and Iola, Kansas, will be required to deliver cement at $1.50 per barrel during the first four months of 1918. This explodes the theory that the government will not sanction federal aid road construction during the period of the war.

## Rock Crusher Completed

The Riverside Portland Cement Company, Riverside, Calif., has completed the installation, at a cost of $20,000, of a giant rock crusher at its plant. The new crusher, which was built by the Traylor Engineering & Mfg. Co., Allentown, Pa., is designed to do away with all hand labor connected with the handling of rock after it leaves the quarry for the crushing plant. It will handle rock 5x7 feet in the one dimension, and of an indefinite length.


*"That's What I Have Been Looking For"*

**A One-Man Car Unloader**

*For Crushed Stone, Sand, Gravel, Slag, Ashes, Etc.—*

**The Sunbury Automatic Car Loader**

30 Foot Steel Continuous Bucket Elevator, 25 ton Wooden Center Discharge, Portable Bin, 8 H. P. Gasoline Engine, Coupled to the Sunbury Automatic Feeder, which is installed under track carrying the material to the elevator, is the combination that has made a cost of *50 cents per car* for unloading, easily obtained.

***Catalog will be sent on request***

MANUFACTURED BY

**The Sunbury Manufacturing Company**

**Sunbury, Ohio**

## Colombian Markets for American Construction Materials and Machinery

The recent substantial increases in sales of American construction materials and machinery to Colombia are pointed out in a report made public today by the Bureau of Foreign and Domestic Commerce, Department of Commerce.

These gains are attributed in part to the fact that the war has cut off former European sources of supply, and it is urged that vigorous effort and a painstaking attention to the requirements of this market are necessary if the present position of the United States is to be maintained when the war is over.

According to the report the progress of Colombia has been handicapped by inadequate transportation, banking facilities, and capital, and the point is made that if Americans will give these subjects the careful study they deserve they will be in a position to take a real part in the development of the splendid natural resources of the country. As these resources are developed there will come a noteworthy expansion in construction activities and, in consequence, an enlarged market for construction materials and machinery.

The author of the report, Special Agent W. W. Ewing, describes minutely the industries and resources of the country and reviews in detail the markets for the various articles included under the heading construction materials and machinery. Copies of "Construction Materials and Machinery in Colombia," Special Agents Series No. 160, can be purchased at the nominal price of 15 cents from the Superintendent of Documents, Government Printing Office, Washington, D. C., or from any of the district or co-operative offices of the Bureau of Foreign and Domestic Commerce.

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## Crushed Slag and Slag Sand for Concrete Aggregate

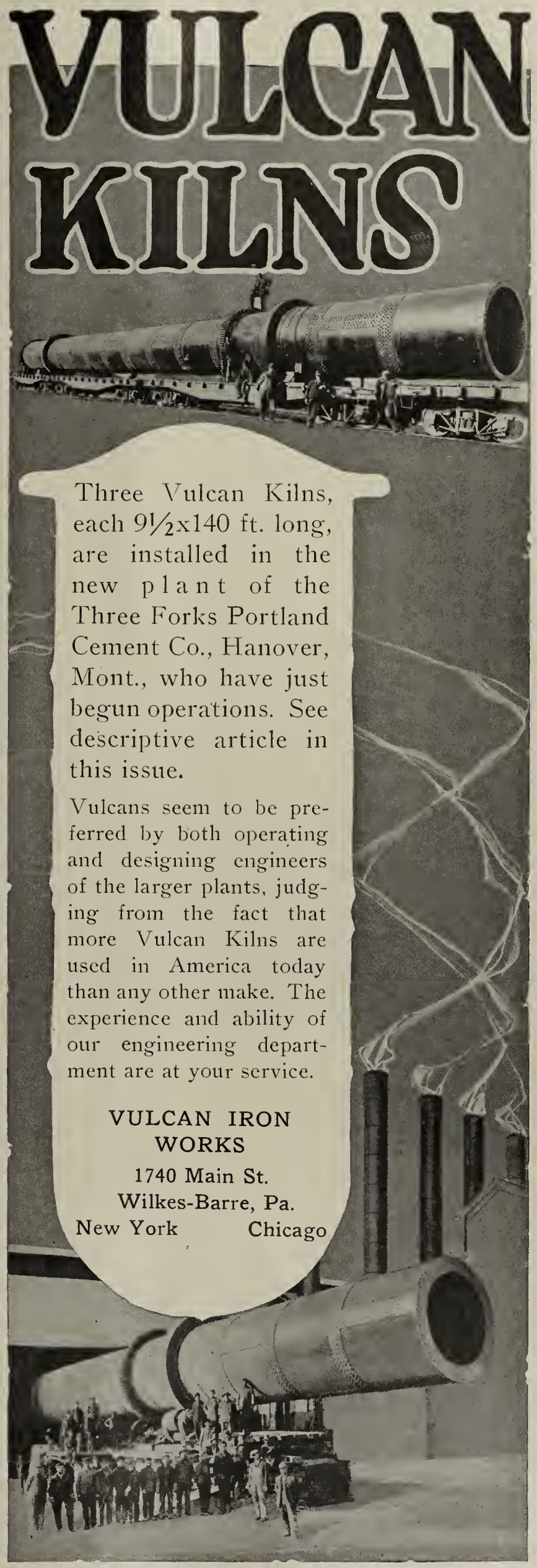
At the request of the Birmingham Slag Company, studies have been made by the United States Bureau of Standards of the value of crushed furnace and foundry slag screened between ¼ and 1½ inch as coarse aggregates, and slag sand all below ¼ inch screen as fine aggregate for use in concrete.

This report includes results up to 28 days for various proportions and different combinations of the crushed slag and slag sand. Some tests in which Potomac river sand was used as the fine aggregate with the crushed slag as coarse aggregate were also made. For comparison a series was made in which the aggregates used were Potomac river sand and gravel.

The tests and condition of cylinders indicate that there is sufficient fine material in the slag sand to produce a mix of sufficient plasticity to handle properly in concrete work. Indications are that this may be corrected to a certain extent by increasing the ratio of the slag sand to the crushed slag aggregate, but not entirely obviated except in mixtures rich in cement. It would, therefore, seem advisable where slag sand is used to add up to 15 per cent of the weight of the cement of some material such as hydrated lime or fine sand.

The tests indicate that both the furnace slag and foundry slag are suitable for use as coarse aggregates in concrete. They are of equal or greater strength than the gravel tested in this investigation. The tests indicate that concrete containing foundry slag is somewhat stronger than concrete of similar proportions containing furnace slag as the coarse aggregate.

Six-months and year tests of most of the concrete mixtures will be reported as soon as completed.



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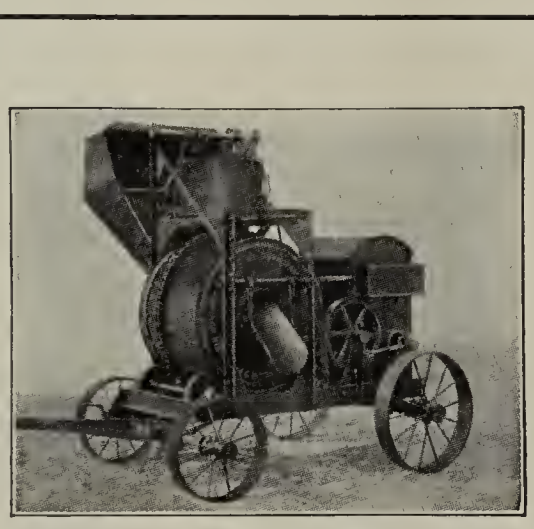
## *The One Prime Requisite*

of a Money-Making Concrete Mixer is the ability to Mix Scientifically.

Say all you please about operating speed, efficiency, dependability, etc., the one thing you require of a mixer first, last and all the time is the ability to produce in the shortest time the best possible concrete with the materials and proportions available. That's scientific mixing — and although it costs more to buy, you can't get maximum return without it.



For those who are satisfied with the "blade" type drum the Austin Drum Mixer is a most logical piece of equipment. Nowhere has it found its equal in round drum mixers.

If a mixer of this type is desired ask for Catalog 21-D

## AUSTIN CUBE MIXERS

mix by kneading the mass as a unit. Study the cube. Imagine it to revolve. Note the zig-zag travel of the center line and how the alternating angle of each opposite side, as it comes up, folds the upper portion of the mass over upon itself, always toward and past the center.

That's scientific mixing.

That's "Cube" mixing.

That's the greatest money-making feature known in mixer design.

And that's why you could afford to pay for a "Cube" almost double the price of an ordinary drum mixer.

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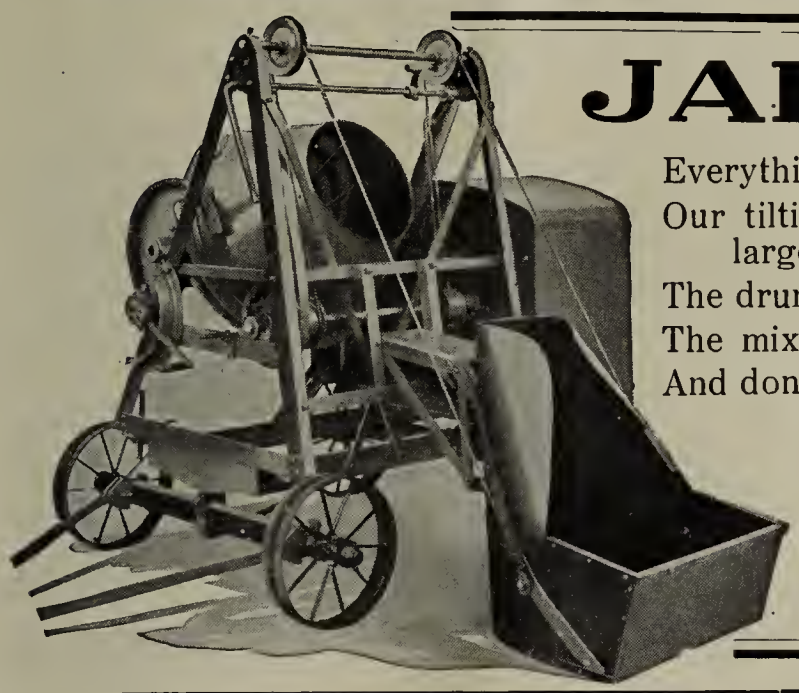

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Our tilting drum guarantees a perfect speedy mix—single opening, large capacity easy to load and unload and always clean.

The drum is entirely open to view at all times.

The mixer has proven by test to be the most economically operated.

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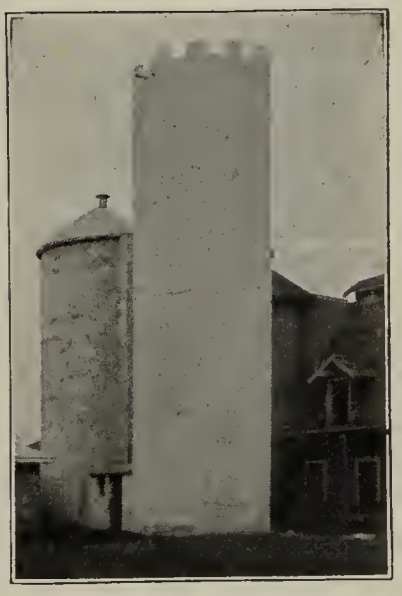
CONKLIN EQUIPMENT **builds silos, grain bins, coal pockets, sand and gravel bins, city watertanks, etc.,** at the rate of 8 feet per day with a lower cost than by any other method. No strain on the walls. We have some bargains for you. Don't delay the game any longer. Our prices are right. We sell machines outright.



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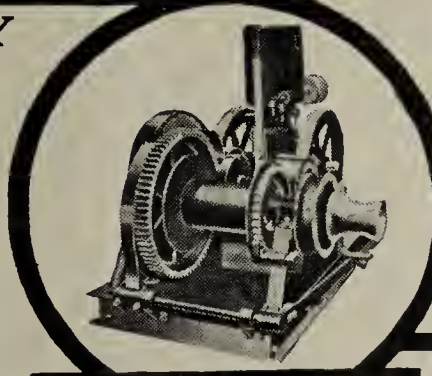

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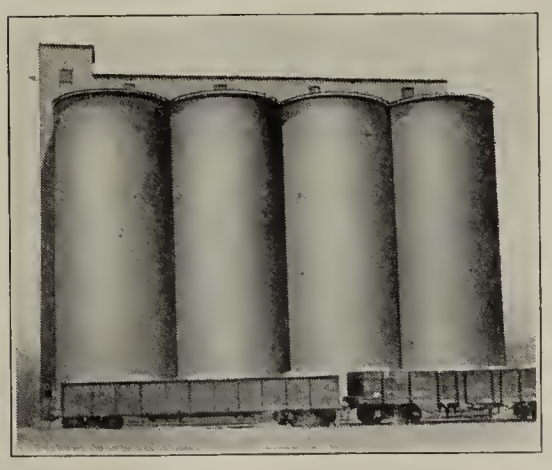

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A Specially Designed

## Mixer for Products Plants

Seventy per cent of the bigger block, tile, brick and specialty concrete products plants of the country use the famous Kent Mixer.

Equipped with automatic feeding device, it makes certain a proper proportioning of aggregates and being continuous in operation, it saves time and labor. The biggest concrete products plant in the world has found that four Kent machines will mix fast enough to keep its many tampers and mold machines busy.

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*Accuracy and Prompt Delivery*

When you want a gear cut you want it **quickly,**—we emphasize our promptness without sacrificing accuracy.

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stand first in accuracy—perfect mesh—silent operation and the quality that counts for long service.

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THE building of concrete grain bins, water towers, coal pockets and silos means a big, paying business for the concrete contractor. Keep yourself out of the "odd-jobs" rut. Build for railroads, elevator companies, milling concerns and the big, progressive farmers. Write today for information about the POLK SYSTEM machine.

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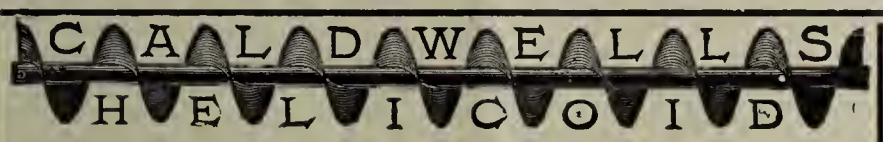


HELICOID Screw Conveyor is heavier, stronger and better made than any other. Requires fewer repairs —no lapped and riveted joints to come apart—flight all one piece. Special hangers, bearings and boxes for cement work. If you have anything to do with the manufacture of cement, you should write for our Catalogue.

Elevating, Conveying and Power Transmitting Machinery.

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### for CONCRETE REINFORCEING

We can meet your Reinforcing Steel Requirements. This means not only quick shipment from the mills but co-operative service for rapid transportation. If you want to know just what your exact cost will be, send us the Blue Prints and we will give you a lump sum bid on all the steel sheared to lengths, bent to specifications and delivered to the job,

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In Open Hearth Steel (New Billet Stock), Hard Grade, and Rail Carbon Steel (Rerolled).

The mechanical bond is theoretically correct and is guaranteed by us, having been designed by expert concrete engineers and approved generally by engineers and architects.

The corners are rounded to prevent splitting of the concrete. Bending, fabricating and setting are easily done with these bars. Sizes ⅜ to 1¼ inch. Lengths up to 85 feet.

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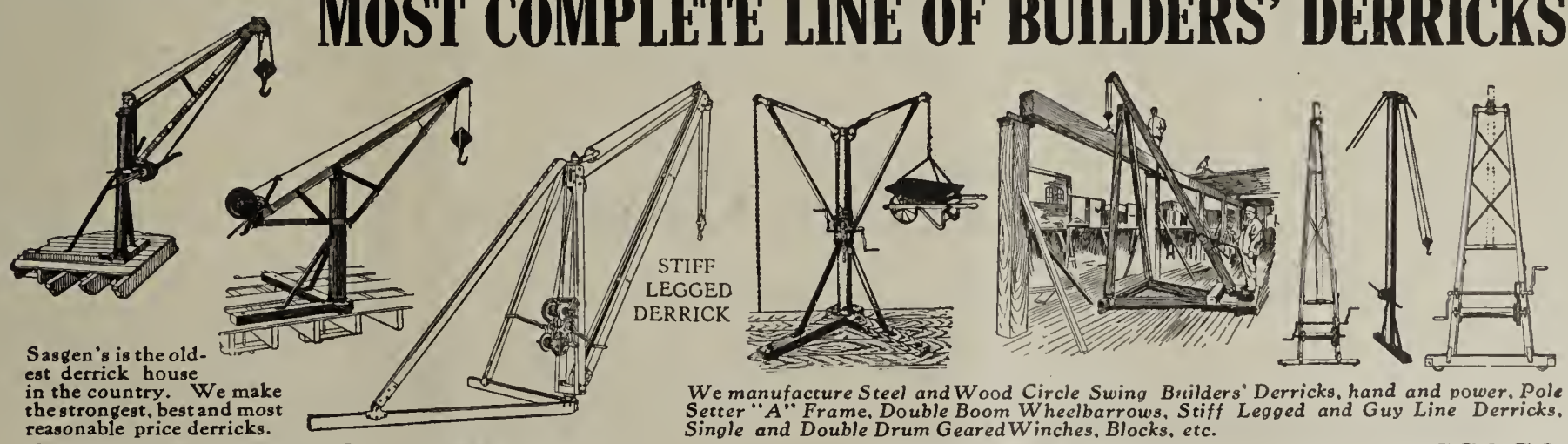
# MOST COMPLETE LINE OF BUILDERS' DERRICKS




Sasgen's is the oldest derrick house in the country. We make the strongest, best and most reasonable price derricks.

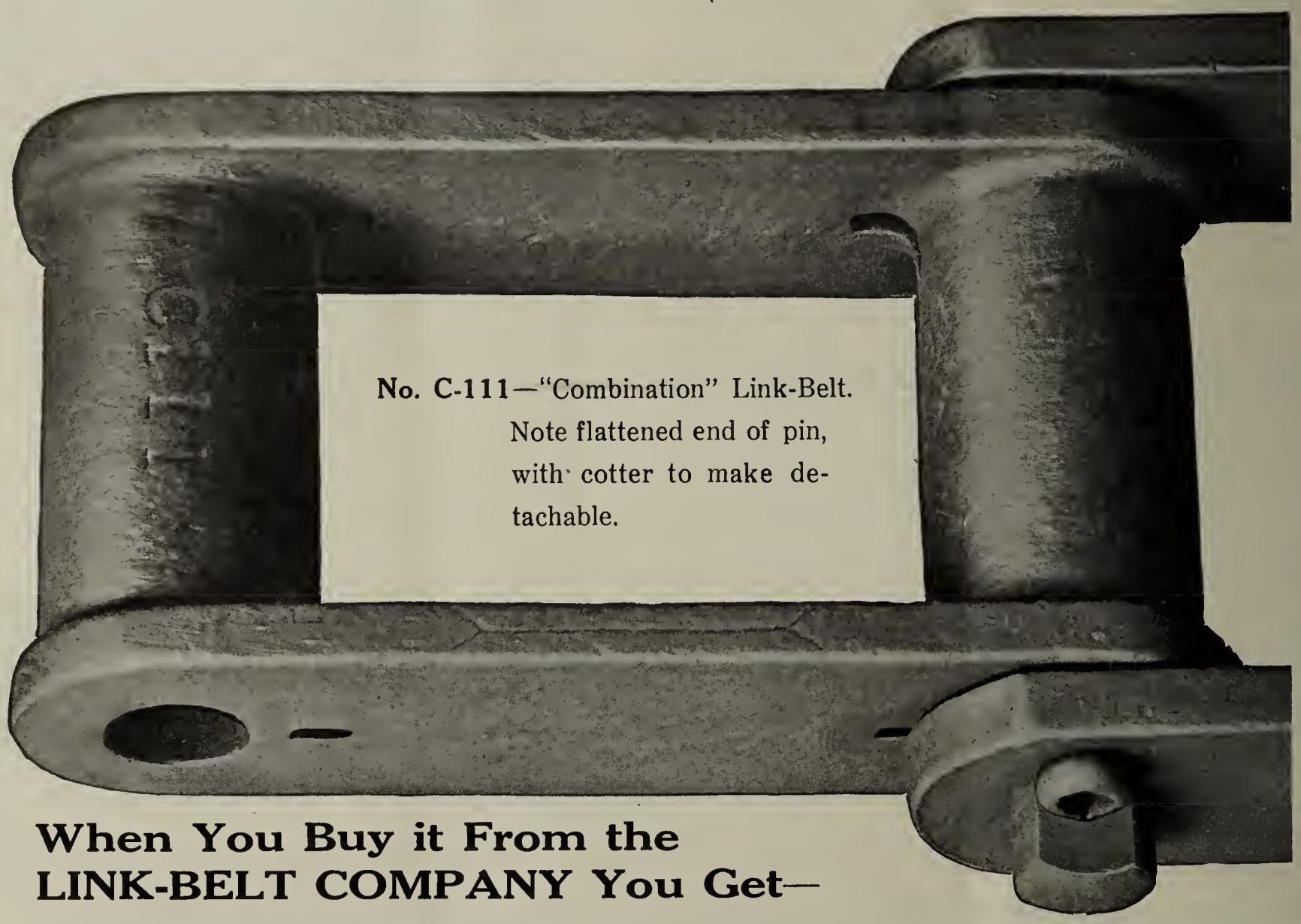
*We manufacture Steel and Wood Circle Swing Builders' Derricks, hand and power, Pole Setter "A" Frame, Double Boom Wheelbarrows, Stiff Legged and Guy Line Derricks, Single and Double Drum Geared Winches, Blocks, etc.*

**SASGEN DERRICK COMPANY, Grand and Albany Aves., CHICAGO**

**WRITE FOR CATALOG No. 15**

# COMBINATION LINK-BELT

## FOR ELEVATING AND CONVEYING PURPOSES



**No. C-111**—"Combination" Link-Belt. Note flattened end of pin, with cotter to make detachable.

## When You Buy it From the LINK-BELT COMPANY You Get—

1. A pin accurately fitted to the side bars. We use a flat portion milled accurately on the end of the pin, fitting into a carefully broached hole in the side bar. Other makers depend upon forged lugs or forged necks under the head to hold the pin in place. These cannot be made accurate enough to prevent a certain amount of looseness. When the pin gets loose, it cuts into the side bar, the pitch elongates, and the links are ready for the scrap pile.

Length of life in service is increased by preventing motion between the pin and the steel side bars which hold it.

2. Pins and Side Bars made of steel having 75,000 to 80,000 pounds tensile strength per square inch, a hard, tough, durable grade of stock. Pins rolled smooth after forging (as the other types of pins cannot be). The rolling compresses and trues up the original hard scale surface.

3. Cast center links made of best grade of malleable iron for durability and strength.

4. Pin holes in heads of links cored smooth and clean by a special process of manufacture, and forming with the rigidly-held, smooth, hard pins, an excellent joint for durability.

5. Accurate pitch and small clearances, furnished by accurately made patterns and dies. This preserves the accuracy of fit between wheels and Link-Belt, and makes both more durable.

6. Close-fitting joints which keep out gritty material that might otherwise work in and cause rapid wear in many classes of work.

The pins are usually provided with cotters, making the "Combination" Link-Belt detachable. Riveted "Combination" Link-Belt can be furnished if desired.

In our Revised Price Book No. 275B, a complete line of wheels is listed for the various sizes of "C" Class "Combination" Link-Belt, and they *fit properly,* not merely "approximately," because they are not makeshift accommodations to a rough, irregular, loose-jointed construction.

In general dimensions the "C" class links correspond with others on the market similarly numbered, and can be substituted without difficulty, on the same wheels, and with the same bolt holes for buckets.

# LINK-BELT COMPANY

**PHILADELPHIA**

New York..... 299 Broadway
Boston..... 49 Federal St.
Pittsburgh..... 1501 Park Building
St. Louis..... Central National Bank Building
Wilkes-Barre.....2nd National Bank Building

**CHICAGO**

Kansas City, Mo..... 407 Finance Bldg.
Seattle.....576 1st Avenue, South
Portland, Ore..... 1st and Stark Sts.
Los Angeles..... 161 N. Los Angeles Street
San Francisco, Eby Machinery Co.,.....35 Main St.

**INDIANAPOLIS**

Denver....Lindrooth, Shubart & Co., Boston Bldg.
Minneapolis.....Link-Belt Supply Co., 418 S. Third
Louisville, Ky....Frederick Wehle, Starks Building
Knoxville, Tenn.....D. T. Blakey, Empire Building
Birmingham...McCrossin & Darrah, Am. Tr. Bldg.
New Orleans....Whitney Supply Co. 418 S. Peters
Toronto, Can.....Canadian Link-Belt Co., Ltd.

# STEEL BARS FOR Reinforcing Concrete

OUR SERVICE
ESTIMATING
SETTING AND BENDING DETAILS
BENDING

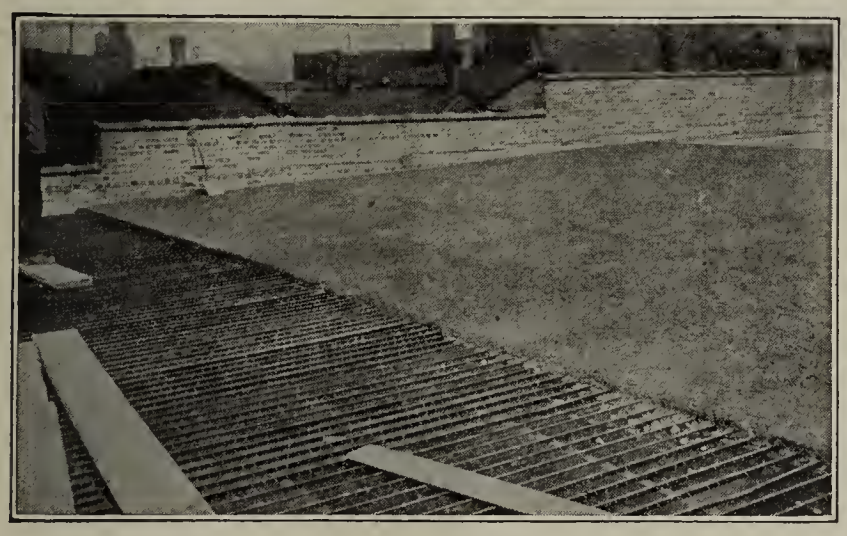
PLAIN AND DEFORMED ROUNDS AND SQUARES

Shipments from Stock and Mill Rolling

## CALUMET STEEL COMPANY

CONTINENTAL AND COMMERCIAL BANK BUILDING
CHICAGO

# No Forms Required if T-Rib Chanelath Is Used



Concrete Floors Without Forms

Concrete Walls Without Forms

THE use of T-Rib Chanelath means conservation of lumber and economy in construction because the mesh of Chanelath acts as a form for concrete floors, roofs and walls. At the same time the rigid T-Rib provides all of the reinforcement necessary for the larger percentage of jobs. The efficiency of the T-Rib as a reinforcing member cannot be questioned. The concrete flows around the head of the T and forms a perfect mechanical bond.

*Our Chanelath Handbook describes the methods for using T-Rib Chanelath in the construction of walls for all types of structures. Let us send you a free copy.*

## North Western Expanded Metal Company

***Members of the Associated Metal Lath Manufacturers***

**Old Colony Building, CHICAGO, ILLNOIS**

## WOULD YOU USE AN INTERMEDIATE SYSTEM FOR CONVEYING YOUR FINISHED GRAVEL FROM PLANT TO CAR IF YOU COULD SPOT THE CAR UNDER THE SPOUTS OF THE BIN?

Not If You Could Help It Would You?

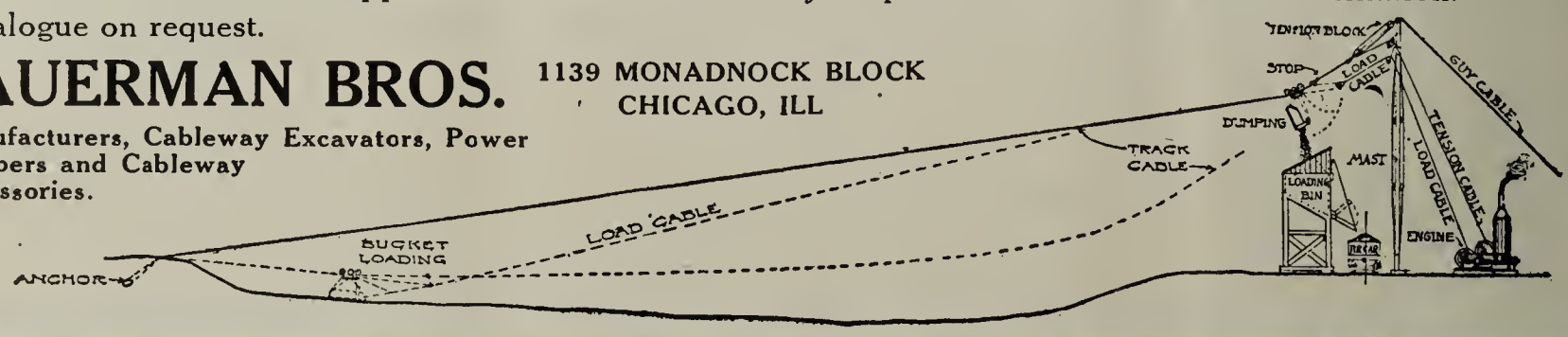
Then is it not just as logical to do away with an intermediate conveying system between **pit** and plant?

Are you using one machine for digging the material and another to convey it to the plant when you could just as well use one machine for the combined operation, saving the additional labor, machinery and upkeep cost?

The Sauerman Dragline Cableway Excavator is digger, conveyor and elevator combined in one.
It is the direct method from pit to plant.
It digs, conveys, elevates and dumps in one continuous forward operation.
Operated by a double drum friction hoist under one man control.
One Machine—One Operation—One Man Control
If you are interested in the application of this machine to your plant write us for further information.
Catalogue on request.

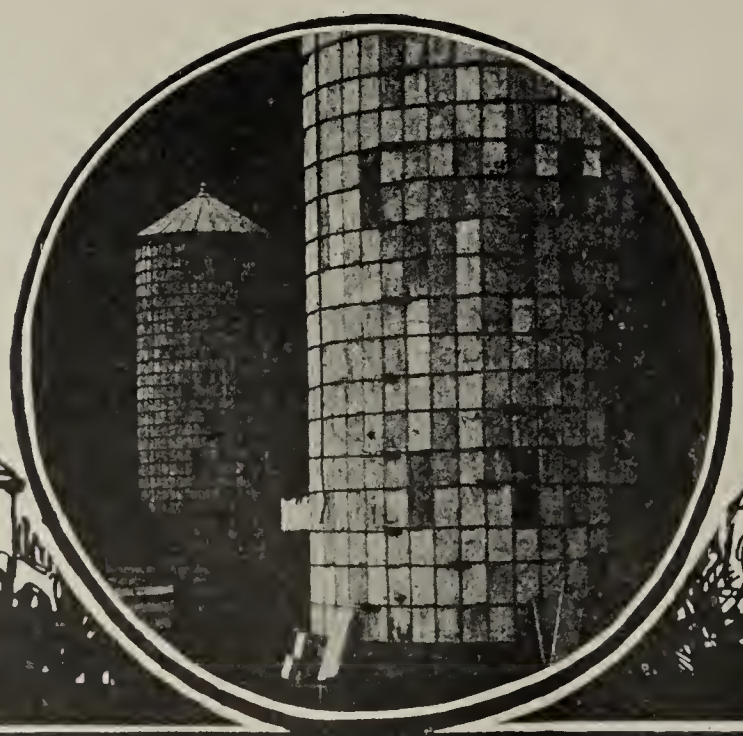
**SAUERMAN BROS.** 1139 MONADNOCK BLOCK CHICAGO, ILL

**Manufacturers, Cableway Excavators, Power Scrapers and Cableway Accessories.**




# The Silo Business will come to you .... if you build CALDWELL SILOS

CALDWELL Silos practically sell themselves. They are storm-proof, water-proof, air-proof, acid-proof, fire-proof, vermin-proof — altogether, trouble-proof. Each stave is a wet mixed reinforced stave having $\frac{3}{8}$″ bar of twisted steel placed diagonally in the concrete. And each stave interlocks with the six adjoining staves; is crossed and held in place by three external bands. Caldwell Silos are permanent, moderate priced and favorites with the farmers.



We have the most business-like silo proposition on the market for the man who will push these silos in your community. There is no territory to buy, no royalty to pay. We will start our representative "right." If you are interested in securing this business, write for full information NOW. Don't delay and let a neighbor get your territory.

**CO-OPERATIVE CONCRETE CONSTRUCTION COMPANY**
**OSKALOOSA IOWA**

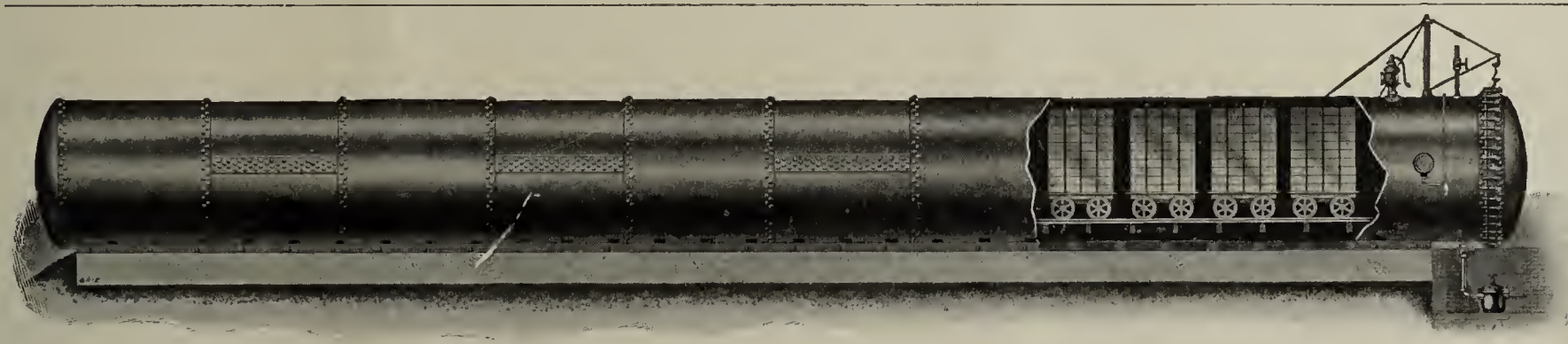
# Sand Lime Brick Machinery

Our complete line of Sand Lime Brick Machinery makes it possible to secure just that machinery which is required to make your plant a success. We favor no particular type of machinery but are guided by the needs of the customer. Our wet and dry grinding mills have transformed a number of unsuccessful plants into dividend producers, while our Presses, Mixers, Hardening Cylinders and other equipment are of equal quality. We can exactly meet the demands of any manufacturer with a quality of machinery which will operate at a profit with a minimum amount of attention and expense.

*Correspondence solicited*

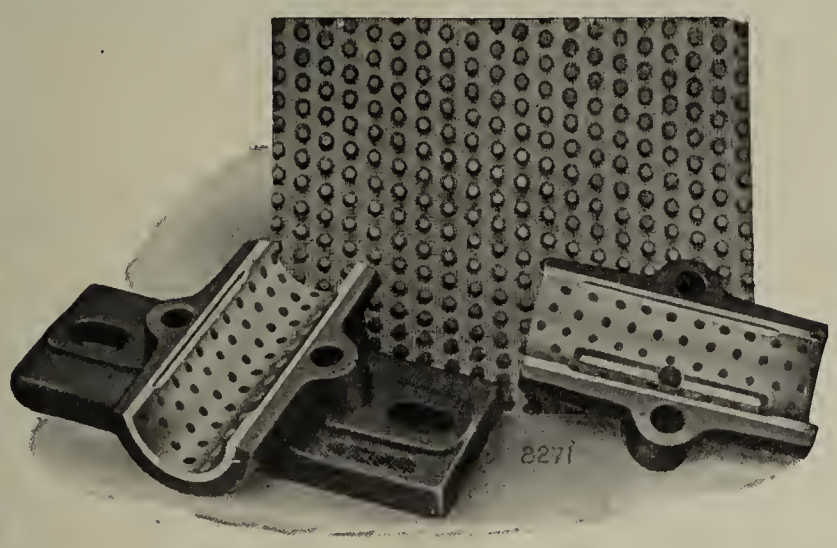
## The American Clay Machinery Co.

WILLOUGHBY, OHIO



# Eliminate Friction—Reduce Labor of Rebabbitting

**PREPARE YOURSELVES NOW** against the serious problems of labor and coal shortage. You must utilize all improved mechanical and lubricating devices as will increase your present production to the fullest extent.



## RANDALL GRAPHITE SHEET LUBRICATOR

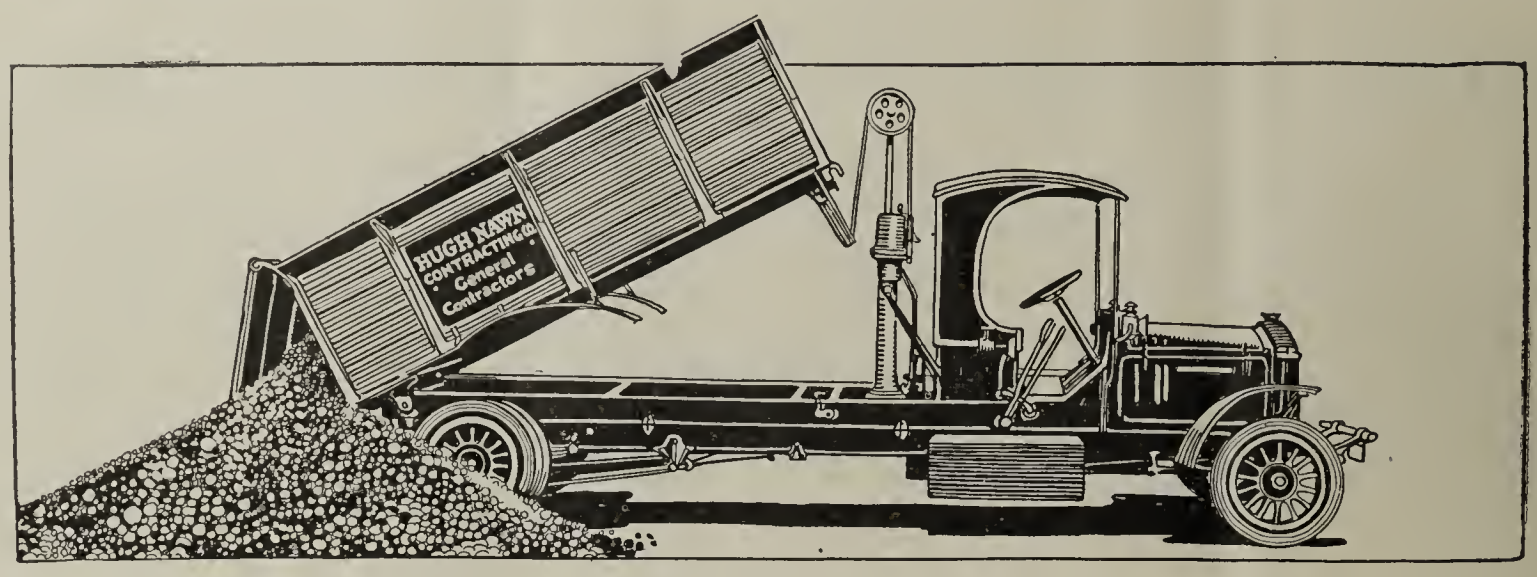
**Will increase the life of your Bearing 300 to 400 per cent**

It will enable your bearings to stand up under heavy pressure and high speed without heating, assuring an appreciable increase in operating efficiency with a substantial saving in operating cost. In addition to the economies of oil, babbitt metal, time and labor, the slight amount of oil required for bearings so equipped overcomes all oil soaking in the belt, and the saturating of the machinery with oil is also avoided. This simple device will displace sufficient bearing metal to pay for the cost of the lubricator.

***Write for circular, information and trial order plan***

## Randall Graphite Lubricator Co.

816 W. LAKE ST., CHICAGO




# Hugh Nawn compares year's operating costs for two well-known makes of Motor Trucks

Hugh Nawn, the Boston contractor, long ago realized that motor trucks are the most efficient and economical hauling units for large operations. The only question in his mind was which is the best truck.

His choice finally narrowed down to two well-known makes, one the Pierce-Arrow, the other a competitive truck of high reputation. For one year these trucks were kept on similar jobs, both operating under the same accurate system of cost accounting. Neither truck was spared, and the severity of service in rush work is shown by the high tire cost for both trucks. As a result of the comparative showing tabulated below, Mr. Nawn is satisfied that the Pierce-Arrow is the best truck made for contracting business.

| COMPETITIVE TRUCK'S RECORD | | PIERCE-ARROW TRUCK'S RECORD |
|---|---|---|
| Miles Run | 13,095 | 15,517 Miles Run |
| Tonnage hauled | 10,768 | 11,013 Tonnage hauled |
| Gallons of gasoline consumed | 4,521 | 4,389 Gallons gasoline consumed |
| Pints of oil consumed | 1,176 | 385 Pints of oil consumed |
| Repairs to motor | $740.37 | $136.16 Repairs to motor |
| Labor repair cost | 249.25 | 152.91 Labor repair cost |
| Tire cost | 888.79 | 841.78 Tire cost |
| Year's operating cost excluding insurance, depreciation etc. | 3,520.27 | 2,768.96 Year's operating cost excluding insurance, depreciation etc. |
| Average operating cost per day including overhead | 19.80 | 16.78 Average operating cost per day including overhead |

A number of other interesting installations are shown in our booklet, "What Pierce-Arrow Motor Trucks Are Doing In The Contracting Business." We shall be glad to send you a copy.

THE PIERCE-ARROW MOTOR CAR CO., BUFFALO, N. Y.

# PIERCE-ARROW

*Motor Trucks*

# BLACK GIANT STITCHED DOUBLE BELTING

THIRTY thousand feet of BLACK GIANT DOUBLE STITCHED BELTING in sizes ten to twenty-four inch eight ply furnished within the last sixty days to two of the largest cement plants in the United States. Both of these plants have used BLACK GIANT DOUBLE STITCHED BELTING for the past five years. BLACK GIANT DOUBLE STITCHED BELTING is the most improved cotton belting manufactured today and is adapted for all kinds of work wherever machinery is run, either for transmission of power, elevators or conveyors.

*Manufactured exclusively by*

**McIlroy Belting and Hose Co.**

**Hammond, Indiana, U. S. A.**

**BELTING**

"V-B" Balata
"AMPERE"
(Canvas Stitched)
"WHITE SEAL"

Write for Prices, Discounts and Samples

**VICTOR BALATA & TEXTILE BELTING CO.**

Factory: Easton, Pa. Main Office: 38 Murray St., New York
Stores: 167 N. Market St., Chicago, and 87 High St., Boston

**CONVEYOR BELTS A SPECIALTY**

# The Aero Pulverized Coal System

is a **Unit System.** The Pulverizer and the furnace is the unit. There is nothing between them but a plain iron pipe. Coal drying is optional.

The AERO is a no-storage system and therefore free from fire and explosion hazards.

The pulverizing, mixing and feeding operation, as well as the furnace, are at one time under the eye of one man. Write for Bulletin.

**AERO PULVERIZER CO., 120 Broadway, NEW YORK**

# THE FULLER ENGINEERING COMPANY

**Designing, Constructing and Operating Engineers**

**Cement and Hydrated Lime Plants a Specialty**

**Reports, Examinations and Analyses of Raw Materials for Cement Consultations Solicited**

**Offices: Allentown National Bank Bldg.**
**ALLENTOWN, PA.**

# WATER SOFTENING OR FILTRATION

FOR BOILER FEED AND ALL INDUSTRIAL USES

WM B SCAIFE & SONS CO PITTSBURGH PA

# The story of HYDRATED LIME

## SHOOTING CONCRETE 4,000 FEET

Out at San Francisco the Twin Peaks Tunnel is being built by R. C. Storrie & Co. It passes through water bearing soil and City Engineer M. M. O'Shaughnessy specified Hydrated Lime in the concrete to make the structure waterproof, eight pounds of hydrate being used to one hundred pounds of cement; the concrete proportions being 1 cement, 2¼ sand and 5 crushed gravel, graded from ¼ to 1¼ inches.

R. C. Hackley, engineer for the contractor, writes:

"On this work the pneumatic concrete placing system is used and we have shot the concrete twenty-six hundred feet through eight-inch pipe and expect to extend this line to four thousand feet or more; the lime being a great help as a lubricant. Where chutes are used they can be much flatter and will carry the concrete much farther with lime in the mix; in fact we have used lime for this purpose and for easier placing in narrow walls and around reinforcement, even when not specified, on account of the labor saved.

"The uniformity of the concrete on this piece of work and the absence of honeycomb patches can be greatly attributed to the use of Hydrated Lime."

*Write any of the following competing manufacturers of Hydrated Lime for complete information about Hydrated Lime in Concrete.*

**Marblehead Lime Co.,**
Chicago—Kansas City

**Port Byron Lime Assn.,**
Port Byron, Ill.

**Tidewater Portland Cement Co.,**
Baltimore, Md.

**Lee Lime Co.,**
Lee, Mass.

**Glencoe Lime & Cement Co.**
St. Louis, Mo.

**Ste Genevieve Lime Co.**
St. Louis, Mo.

**Dutchess County Lime Co.,**
Dover Plains, N. Y.

**Palmer Lime & Cement Co.,**
103 Park Ave., New York, N. Y.

**Rockland & Rockport Lime Co.,**
New York—Rockland, Maine—Boston

**The A. & C. Lime Co.,**
Canton, Ohio.

**Kelley Island Lime & Transport Co.,** Cleveland, Ohio.

**National Lime & Stone Co.,**
Carey, Ohio.

**Ohio Hydrate & Supply Co.,**
Woodville, Ohio

**John D. Owens & Son Co.,**
Owens, Ohio.

**Woodville Lime & Cement Co.,**
Toledo, Ohio

**Merion Lime & Stone Co.,**
Norristown, Pa.

**Vermont Marble Co.,**
Proctor, Vermont

**Riverton Lime Co.,**
Riverton, Va.

## Immediate Delivery

2—No. 6 McCully Gyratory Crushers equipped with manganese steel head and concaves and heavy duty shaft, standard discharge 12″ x 44″ feed openings, 34 x 16 driving pulley, weight 48,000 lbs. each, complete. Capacity 50 tons 2″ stone an hour; 120 tons 4½″ stone an hour. Bought in 1916, used only one month, excellent condition.

1—Patnoe Steel Chain Elevator complete on wood frame with geared head and driving pulley, 35′ centers, 53 elevator buckets 42″ x 19″. Bought in 1916.

1—No. 8 Geared Head Elevator complete on wood frame with 32″ 8-ply belt, 69′ centers, 105 elevator buckets 30″ x 17″. Bought in 1916.

1—Thomas 3-drum Electric Hoist equipped with latest improved boom swinging attachment with 150 H.P. A.C. Wagner motor 514 R.P.M.

1—10 x12 Chicago Pneumatic Tool Co. Air Compressor, Style GCSC, 11 x 18 x 16½, belt drive with horizontal Air Receiver 4½ x 11½, 500 cu. ft. per minute.

OSCAR DANIELS CO.
First National Bank Bldg,
Chicago

## Scrap Cement Bags

We are in the market for an unlimited quantity of scrap cement bags. Write or wire prices, stating quantity and whether dusted or not.

**Clayton Shoddy & Cotton Mills**
**CLAYTON, N. J.**

FOR SALE

## HIGH-GRADE CRUSHING ROLLS

One set—42 x 16 in. Power Mining & Machinery Co. "Superior" crushing rolls.

Two sets—36 x 16 in. Chalmers & Williams Crushing rolls.

**All in first-class condition, used only short time and with extra cores and shafts**

**Rolls on hand here subject to inspection and immediate shipment**

*Write for prices and any other further information desired.*

**Galena Iron Works Corporation**
**GALENA ∴ ILLINOIS**

# STEAM SHOVEL

Marion Model No. 20 with 1¼ yard Dipper as good as new.

*Can Make Immediate Shipment*

**Calumet Iron & Metal Co.**
**4022 S. Wells Chicago, Ill.**

## We have the following equipment FOR SALE:

1—Marion Steam Shovel, Model "G."
5—Rotary Kilns, 7′x6′x100.
2—5′x22′ Gate Tube Mills.
12—Kent Mills.
1—Maxicon Mill.
3—Jeffrey Hammer Mills, 36x42, and smaller, Table Feeds.
1—Williams Hammer Mill, No. 2.
3—Newago Screens.
9—Emerick Separators.
2—5′x30′ Ruggles Coles Dryers.
1—No. 8 Gates Gyratory Crusher, Style "K."
1—No. 2 Gates Gyratory Crusher.
6—Sturtevant No. 5 Monogram Fans.
8—Sturtevant Kiln Coal Feeding Bins and Feeders.
1—Double Drum Hoisting Engine, 7″x10″ cyl.
2—Automatic Weighing Mach. Co. Cement Scales.
1—Fairbanks Track Scale.
12—Steel V Body Dump Cars, 3′0 gauge.
1—Steel Building, 150x120.
1—Steel Building addition, 45x31.

**The Sandusky Cement Co.**
**817 Engineers Bldg.**
**Cleveland, Ohio**

## STEEL SHEET PILING

**All sizes, all makes bought and sold**
**WEMLINGER STEEL PILING COMPANY**
**1 State St. NEW YORK CITY**

# FOR SALE—IMMEDAITE DELIVERY

***Owned By Us and Sold Under Absolute Guarantee***

### STEAM SHOVELS

4—70-C Bucyrus, shop numbers 1609, 1351, 1126, 1287, 1245, 2½-yd. dippers.
2—Standard 70-ton Bucyrus, shop numbers 733 and 572, 2½-yd. dipper.
2—45-C Bucyrus, shop numbers 1297, 1202; 1½-yd. dippers.
1—Model 60 Marion, shop number 1685.
1—85-C Bucyrus, shop number 1649, 4-yd. dipper.

### DRAG LINES

1—Model 220 Marion, all steel drag-line, shop number 2839, mounted on 4 equalizing 4-wheeled trucks; equipped with 60 to 90 ft. boom and 2-yd. Page bucket.
1—Class 24 Bucyrus dragline on skids and rollers, 100-ft. boom, 3½-yd. bucket, equipped with electric light plant, also two extra buckets and a large amount of extra parts.
1—No. 2 Monighan all steel dragline, mounted on skids and rollers, 60-ft. boom, and 2-yd. Page bucket.

### DUMP CARS

1—No. 10 Monighan all steel gasoline machine, mounted on walking device, equipped with 40-ft. boom and 1-yd. Page bucket.
30—16-yd. standard gage Western air dump cars, with steel lined floors.

### DUMP CARS—Con.

50—12-yd. standard gage, Western air dump.
15—12-yd. standard gage Oliver air dump.
100—3-yd. and 4-yd., 36-in. gage Western cars.
30—1½-yd., 24-in. gage.
7—Heavy duty, 4-yd. Western, 36-in. gage dump cars.

### REVOLVING TRACTION SHOVELS

1—18B Bucyrus Traction Shovel, shop number 2005, ⅞-yd. dipper (for rental only).
1—25B Bucyrus traction shovel, shop number 1850, 1¼-yd. dipper; also special long dipper arm and ⅞-yd. dipper in addition to the standard equipment.
1—No. 0 Thew shovel, ⅝-yd. dipper, shop number 894.

### LOCOMOTIVES

3—Standard gauge Vulcan saddle tank locomotive, 11x16 in. cylinder, weight 21 tons, automatic coupler, steel cabs, steam brakes, 165 lb. steam pressure. Built new in 1912 and 1913.
1—Standard gage Porter saddle tank locomotive, 10x16 in. cylinder, weight 20 tons, shop number 3492.
2—17x24 6-wheel switchers, built new in November, 1913. Weight 50 tons, steam pressure 180 lbs.

### LOCOMOTIVES—Con.

2—16x22 4-wheel switchers, C., M. & St. P., J-2 class, weight 32 tons.
1—18x26, 8-wheel passenger type locomotive, Schenectady build; total weight 51 tons; weight on drivers 33 tons.
5—36-in. gage, 10x16 and 9x14 Davenport saddle tank locomotives.
1—7x12-in., 24-in. gage Davenport, shop number in the twelve hundred.

### RAIL, SWITCHES, SPIKES, ETC.

Compressor with reservoir, weight 15,000 lbs.
75 lb. rail, complete with target switch-stands, frogs, points, etc.
1—Carload 4½″, 5″ and 5½″ spikes.
10 tons angle bars for 70 lb. and 75 lb. rail.
100 tons 52 lb. rail.
210 tons 70 lb. rail.
500 tons 75 lb. rail with angle bars, as good as new.

### SHOP EQUIPMENT

1—16x16x18-in. Laidlaw - Dunn - Gordon Air Compressor with reservoir, weight 15,000 lbs.
1—Tire Lathe, 52-in. Swing, complete with countershaft.
1—Stationary Engine; horizontal center crank type; 10x12 in. cylinder, slide valve type; 25 H.P.

## CLAPP, NORSTROM & RILEY EQUIPMENT CO.

**12 and 14 South Canal St., Chicago, Illinois**

## EXCEPTIONAL OPPORTUNITY

# Complete Cement Plant

## Capacity 750,000 Bbls. Annually

**LOCATION, BEDFORD, IND.**

We own and offer for sale the above plant and offer it either as a whole or in part. Quotations will be made on any parts desired. Buildings:

| | |
|---|---|
| Raw Material Building | 130x135 ft. |
| Raw Material Annex Building | 43x 90 ft. |
| Rotary Kiln Building | 95x180 ft. |
| Coal Drying and Grinding Bldg | 58x 80 ft. |
| Dry Grinding Building | 90x114 ft. 5 in. |
| Storage Warehouse | 80x250 ft. |
| Boiler and Power House | 91x100 ft. |
| Repair Shop | 30x119 ft. |
| Coal Storage Building | 25x100 ft. |

All buildings structural steel with brick walls.

2—300 H.P. Cahall Vertical Water Tube Boilers.
4—250 H.P. Geary Water Tube Boilers.
1—375 H.P. Heine Boiler.
All 160-lb. pressure.
1—1000 K.W. Vertical General Electric-Curtis Turbo-Generating Set.
1—800 K.W. Vertical General Electric-Curtis Turbo-Generating Set.
Both sets 3 phase, 25 cycle, 480 volts; one complete switchboard panel for the above, also condenser for the turbines, circulating pumps—everything complete and now in position.
20—10-ton steel hopper dump cars.
2—Austin No. 6 Gyratory Late Type Crushers, with elevators, screen, etc.
1—60 in. x 50 ft. Moser Dryer.
2—60 in. x 40 ft. Sinker Davis Dryers.
1—Allis-Chalmers set of Anaconda Rolls, sizes 40x15 in.
3—5x22 ft. Gates Tube Mills.
32—30-in. Griffin Pulverizing Mills.
10—Allis-Chalmers Rotary Kilns, 7 ft. to 5 ft. 6 in. x 60 ft., complete with Automatic Kiln Feeder Boilers, coal pulverizing equipment, etc.

Besides the above, the plant is equipped with all the necessary conveyors for material, elevators, all copper wire for transmitting current, laboratory complete, office buildings, stone quarry, shale quarry, sidings, workmen buildings and approximately 325 acres of Real Estate.

*For Prices and Full Particulars Address*

**McCOY-BRANDT MACHINERY COMPANY**

**216-218 Penn Avenue, Pittsburgh, Pa.**



# MOLDS MOLDS MOLDS

**Complete Outfit for "Ornamental Concrete"**

Consisting of

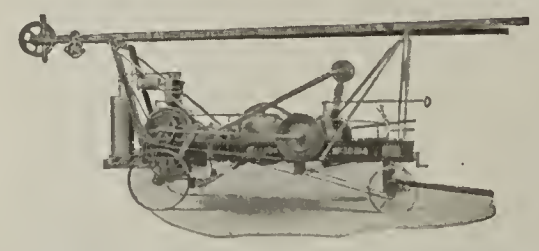
**Iron and reinforced Composition Molds and Patterns as: Columns, Balusters, Balls and Bases, Pier Blocks, Roofing Finials, Pedestals, Sundials, Benches, Flower Vases, Flower Boxes, Jardinieres, Monuments, Tombstones, Friezes, etc.**

**BARGAIN** if taken immediately, on account of old age and sickness. May divide.

**HANS HIRSCH** CARONDELET and CLIO STS. **New Orleans, La.**



# A Big Blast-Hole Drill That's Reliable



**The Cyclone No. 14**

Heavy, solidly braced frame — Sill timbers 4" x 14". All machinery placed directly on the main sills protecting it against strains and preventing top heaviness. **Eighty per cent (80%) of the castings are cast steel**—not cast iron. The Cyclone No. 14 is the only Blast-Hole drill so built. Furnished in Steam, Gasoline, Compressed Air or Electric Power; traction or non-traction.

**The Sanderson Cyclone Drill Co., Orrville, Ohio**

**Eastern and Export Office, 50 Church St., New York, N. Y.**



## FOR SALE

1—McMyler 12-ton, 4-wheel locomotive cranes 40′ boom, one yard bucket.
1—Rand 12.0′ compression, steam driven 40-steel, 3 yard, 36″ quarry cars. Donahue & Co., 20 West Jaskson Boul., Chicago.

## AIR SEPARATORS WANTED

Wanted to buy second-hand air separators similar to Osborn, Raymond or Stroud make. Address M. N., care of CEMENT & ENGINEERING NEWS, Transportation Bldg., Chicago, Ill.

## WANTED

Carload French or Danish Flint Pebbles for prompt delivery. Would prefer shipment in sacks but can use in bulk. Quote price per ton, giving size of pebbles, grade, etc. Address Southern Cement Company, Birmingham, Ala.

## ROTARY KILN FOR SALE

New 5′x50″ complete Rotary Kiln lined with 6″ Davis Cupola Blocks and including driving mechanism. Details and blue prints on application. Albert Trostel & Sons Co., Milwaukee, Wis.



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### FOR SALE

2 sets Power & Mining Machinery Co. Superior Crushing Rolls, 36"x 16", with adjustable feeding conveyors on steel fromes. Machinery good as new. Dolese & Shepard Co., 108 So. La Salle St., Chicago.

### CHEMIST WANTED

Assistant chemist wanted for cement plant at Hanover, Montana. One with cement experience preferred. For particulars regarding position address W. H. Andrews, Chief Chemist, Trident, Mont.

### WANTED

Second-hand Smidth Kominuters and Tubemills. Quote price, description, location. Address P. O. Box 1941, New York, N. Y.

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### WANTED.

Chief Engineer for 1200 HP Steam Power Plant connected with Cement Mill. Location town of 25,000 population. Excellent living conditions. Good opportunity for capable and ambitious man. Give detailed experience and salary expected in first letter. Address S. L. c/o Cement and Engineering News, 672 Transportation Bldg., Chicago.

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### CHIEF ENGINEER WANTED

Wanted—Chief Engineer for Portland cement plant in Lehigh Valley familiar with water tube boilers, Cross compound Corliss condensing engines, A. C. generators and motors. Give full experience and references, salary wanted and how soon you could report for work. Address C. C. H., c/o Cement & Engineering News, 672 Transportation Bldg., Chicago, Ill. Ill.

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### CEMENT CHEMIST OPEN FOR POSITION

Position as Chief Chemist of large Portland Ceement plant wanted by Cement Chemist of long experience. Address, L. U. P., c/o Cement & Engineering News, 672 Transportation Bldg., Chicago, Ill.

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# READY FOR SHIPMENT

### LOCOMOTIVE CRANES

1—10-ton American, 4-wheel, 38-ft. boom, bucket operating drums.
1—10-ton Industrial, 4-wheel, 34-ft. boom, bucket operating drums.
1—10-ton Orton and Steinbrenner, 8-wheel, M. C. B. 40-ft. boom, bucket drums.

### LOCOMOTIVES

2—Baldwin, standard gauge, **saddle tanks;** one 33-ton, the other 35-ton; cylinders of both 14x24; four driver type; Hunt's inspection certificate of approval furnished.
Baldwin, 7½-ton, 24-in. gauge, saddle tank.

### BOILERS

4—200 H. P. (Heine type) water tube boilers.

### AIR COMPRESSORS

Ingersoll-Rand duplex, two-stage steam driven, capacity, 1,190 ft. air at 110 lbs. pressure.

### MINE HOISTS

Lambert, 10x12 double cylinder, single drum, 36-in. dia., 24-in. face. Drum grooved, will take up ⅞-in. cable. Drum flanges 8 in. deep. Link motion.

Brownhoist, 9x12 double cylinder, single drum, 48-in. dia., 36-in. face, friction type. Drum grooved for ⅝-in. dia. cable.

### DERRICK HOISTS

1—Flory, 7x10 double cylinder, double drum, with boiler.
2—Byers, 16 H. P. double cylinders, double drum, equipped with boilers and swinging gears.

### LATHES

1—Niles, double back geared, 48-in. swing, 18-ft. bed.
1—Lodge & Davis Imperial Type, 22-in. swing, 10-ft. bed.

## F. MAYER

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# Second Hand Equipment—For Sale

## MARSH'S GUARANTEED LIST

### Buckets

1—2 -yd. Hayward
4—1½-yd. clam-shells, various makes
1—1 -yd. orange-peel bucket
1—1 -yd. Page Dragline bucket
1—2 -yd. Page Dragline bucket
1— ¾-yd. Slack-line outfit complete

### Cars

20— 4 -yd. Western 36-in. gauge cars
20— 1½-yd. Western 24-in. gauge cars
30—12 -yd. Western standard-gauge cars
30— 2½-yd. quarry cars, steel bodies
20—60,000 capacity gondolas

### Compressors

1—Ingersoll-Rand Imperial type X-B-2, capacity 2400 ft., belt-driven
2—Bury Duplex, cap. 500 ft. each
1—Ingersoll-Rand Imperial Type, 2 stage belted, 250 ft. per minute. New
1—14 x 12 Laidlaw-Dunn-Gordon belted
1—Sullivan 2-stage steam-driven, cap. 1800 ft.
Lots of others.

### Locomotives

2—10 x 16—36-in. gauge dinkies
2— 9 x 14—36-in. gauge, just overhauled
2— 7 x 12—24-in. gauge
1—150-ton Shay, geared, almost new
1—20 x 28 Mogul, good as new
1—90-ton Mikado type, new
2—60-ton 10-wheelers, 170-lb. pressure

### Crushers

1—No. 5 McCully
1—No. 6 Gates, style K, complete plant
1—No. 7½ Austin, complete plant
1—No. 8 McCully
1—No. 9 Gates K, good as new
1—No. 30 Kennedy
1—20 x 24 Traylor Jaw Crusher
1—Shaft for No. 7½ Gates

### Road Builders Outfit

10,000 ft. Koppel 24-in. ga. portable track
30 Koppel V-shape 24-in. ga. cars

### Drag-Lines

1—Page drag-line, 50-ft. boom, 1-yd.
1—White Traction, 40-ft. boom, 1-yd.
1—Class 14 Bucyrus
1—Slack-line outfit complete, 1-yd.

### Hoisting Engines

2—7 x 10 D.C., D.D., hoists, American
1—9 x 10 3-drum, with swinging gear and boiler
2—10 x 12 D.C., D.D. American, with boilers
1—6¼ x 8 Builders' Hoist, reversible
1—Flory cableway, complete, 1000-ft. span
1—American Swinging Engine

### Cranes

1—15-ton 4-wheel American, single line
1—15-20-ton Brownhoist, 8-wheeled M.C.B., almost as good as new
1—15-ton Browning, 4-wheeled
1—O & S, 12-ft. gauge, all steel, good as new
2—McMyler 14-ft. gauge, all steel, fine

### Steam Shovels

1—No. 1 Thew traction shovel, 1-yd.
1—No. 0 Thew shovel, first-class
1—18B Bucyrus Traction
1—Model "41" Marion st. gg. trucks
1—Model "60" Marion 2½-yd. dipper
1—Model "61" Marion, extra high boom
1—70-ton Bucyrus, first-class
1—Model "50" Marion, almost new

### Rollers

1—10-ton, 3-wheeled
1—10-ton Austin gasoline
1— 8-ton tandem

### Rail

3,000 tons, from 30 to 60 lb.

### Miscellaneous

1—Keystone Excavator, new last winter
1—10 x 6 x 10 Duplex steam
1—10 Morris Sand Pump
1—No. 2 Vulcan steam hammer
20—Steam drills, various sizes and makes
2—Steam Tugs
4—Dump scows
4—Tanks, various sizes
1—Holt 40-60 Caterpillar tractor
1—Huber Steam Tractor
1—Western Elevating Grader, good as new
1—Derrick car, 9 x 12, 3-drum engine, with claw shell, good condition

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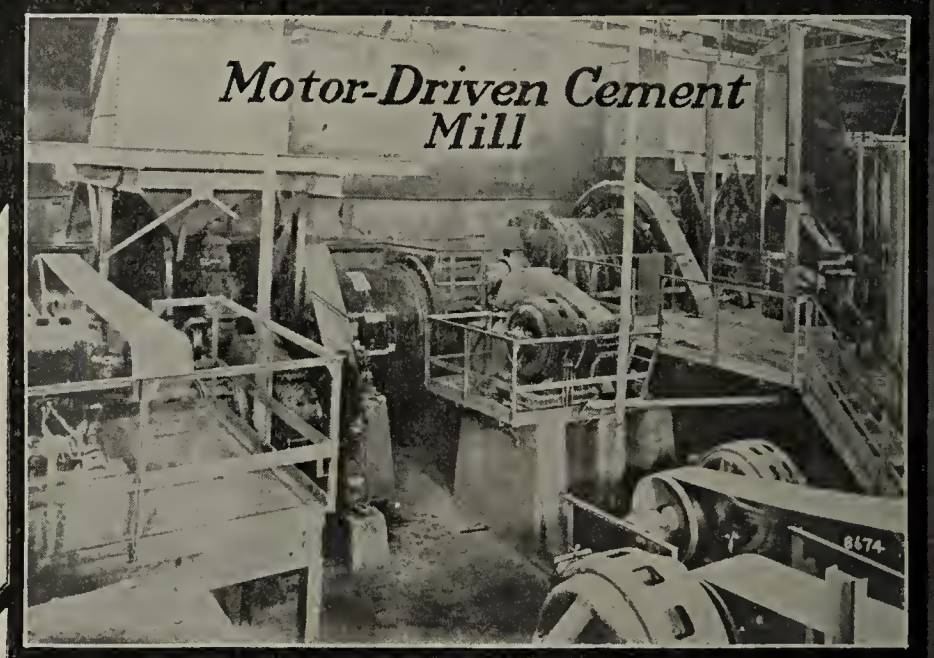


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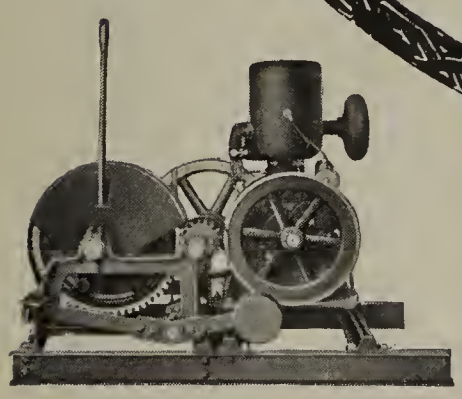

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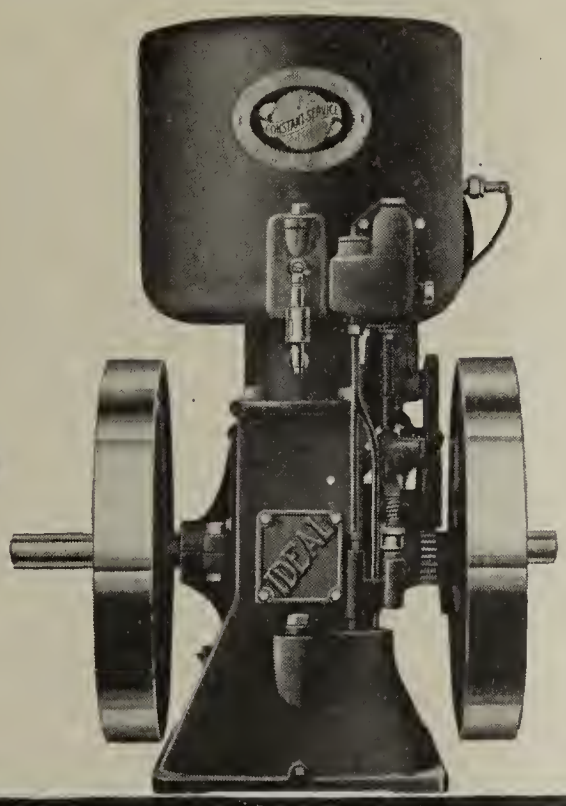

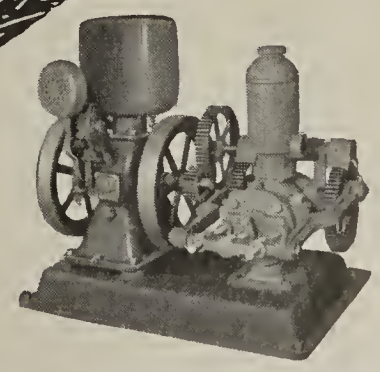

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Size of Crusher: 24 inches. Material Crushed: Gravel and hard heads. Length of time operated: two years. Size of feed: 2 inches. Size of product: ½ inch. Horsepower used: 20. Tons crushed per hour: 25. Original crushing discs still in use. No time lost on account of breakage.

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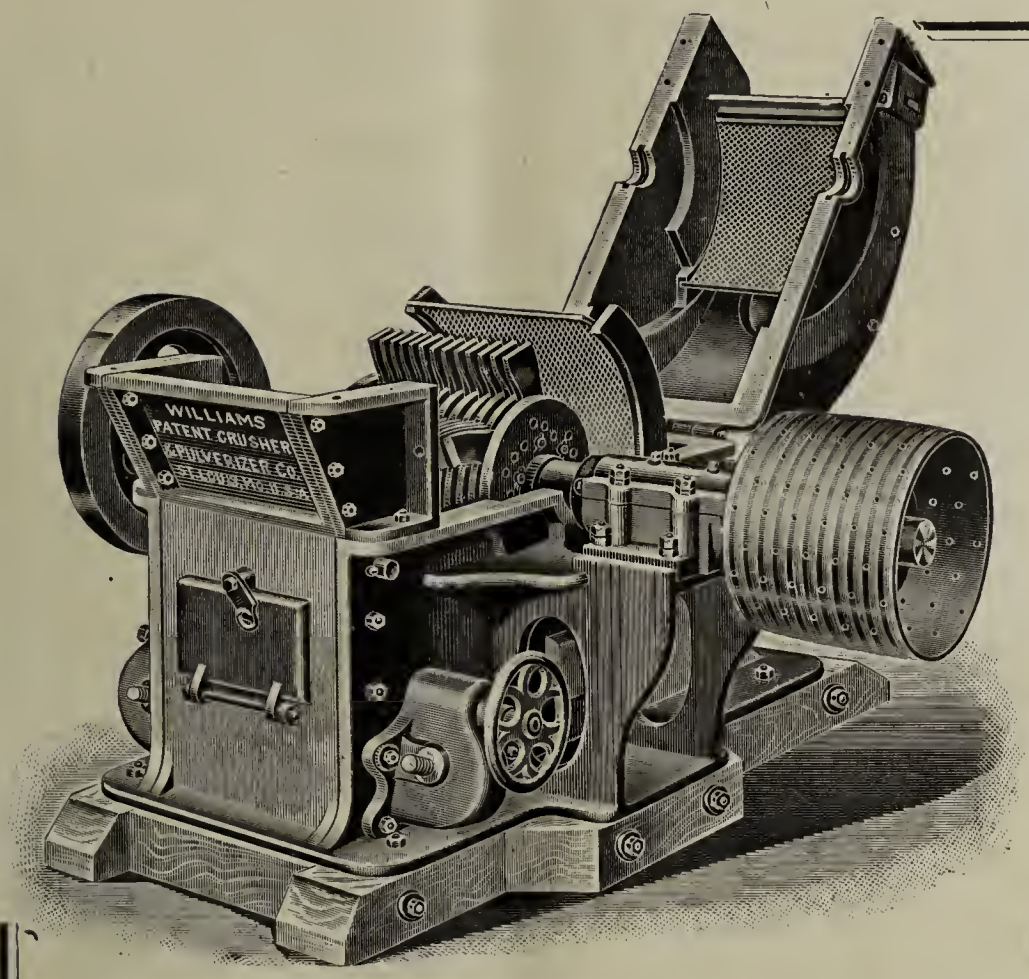


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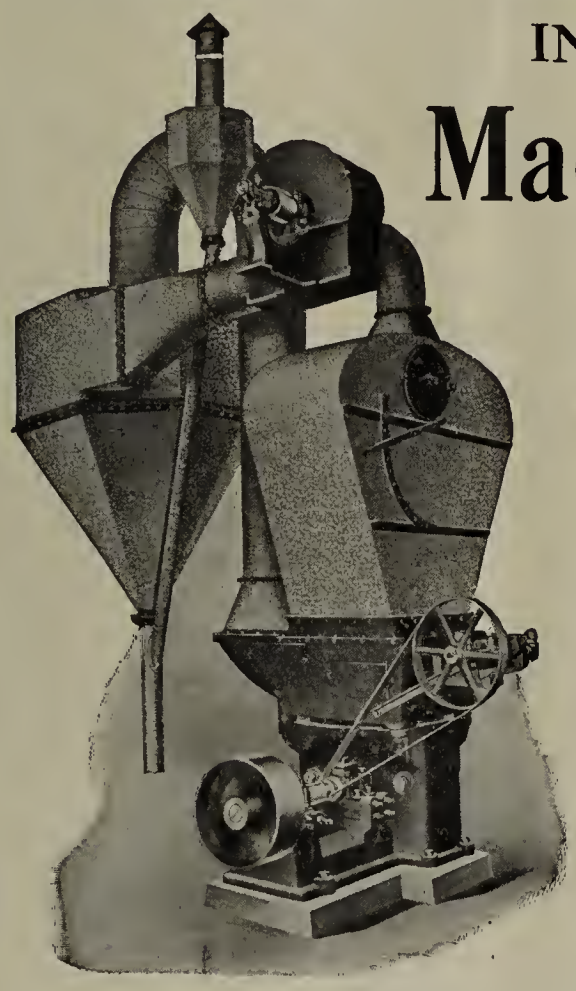

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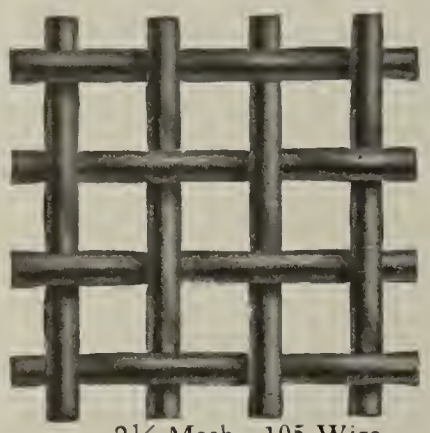
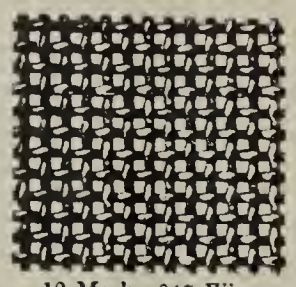


2½ Mesh; .105 Wire



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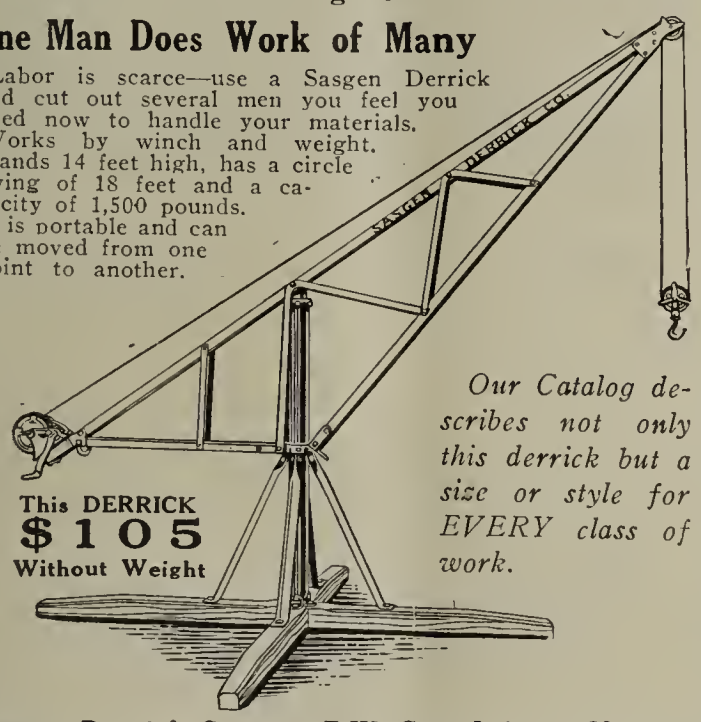


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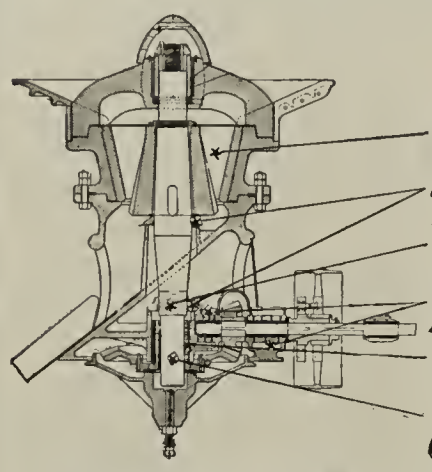

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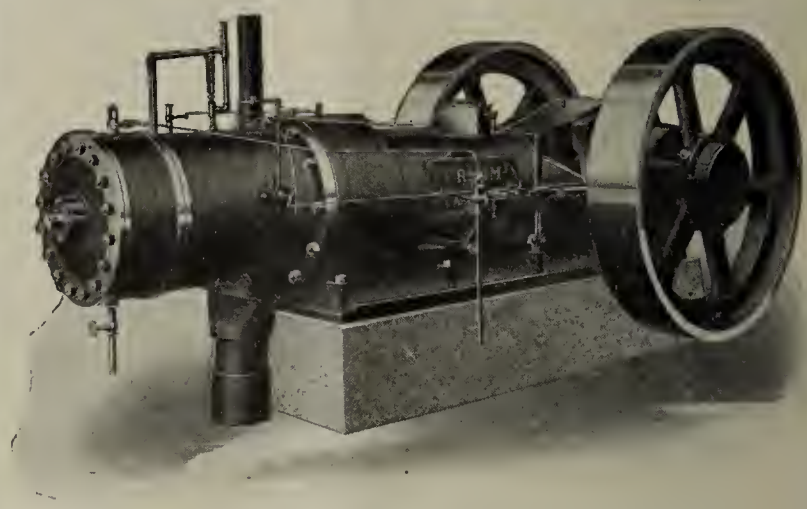

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Mr. W. G. Clark, Victorville, Calif.
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Fisher Bldg., Chicago, Ill.

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Yours truly. L. D. GILBERT, Supt.

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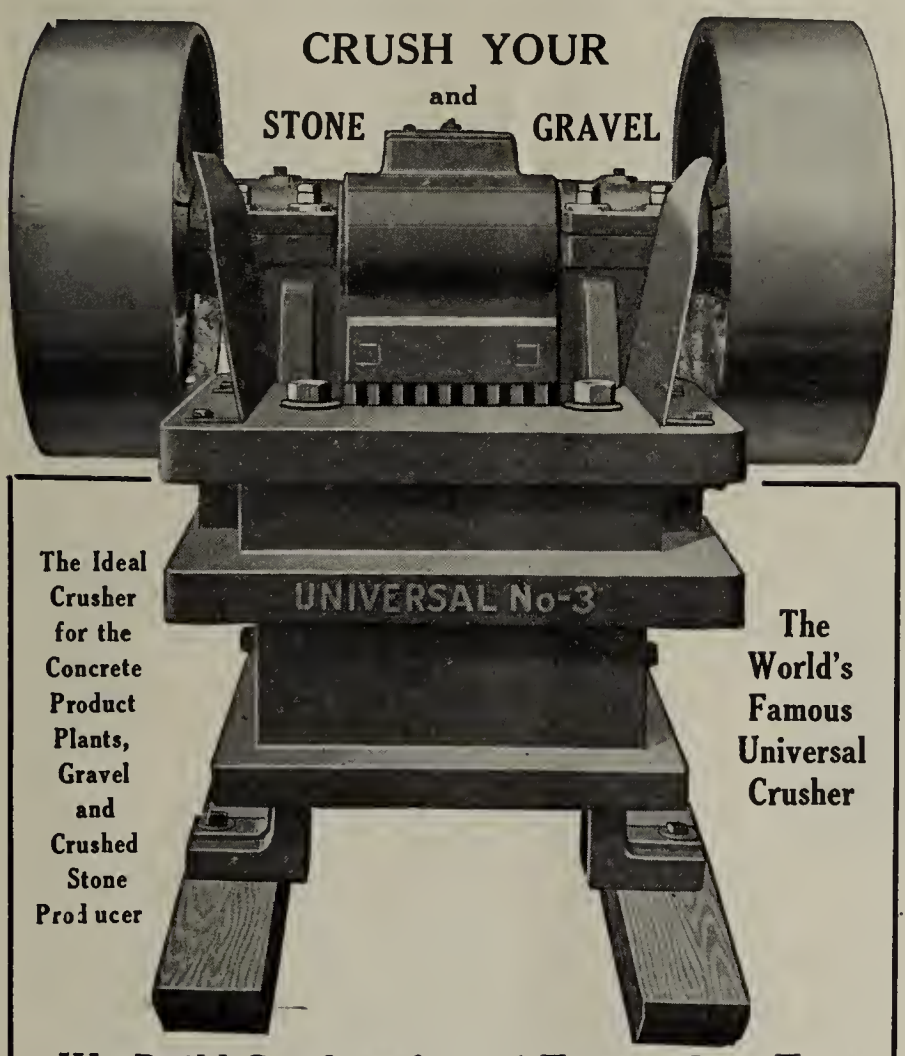


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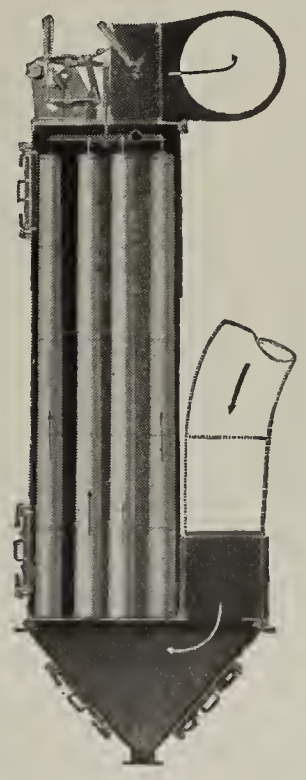

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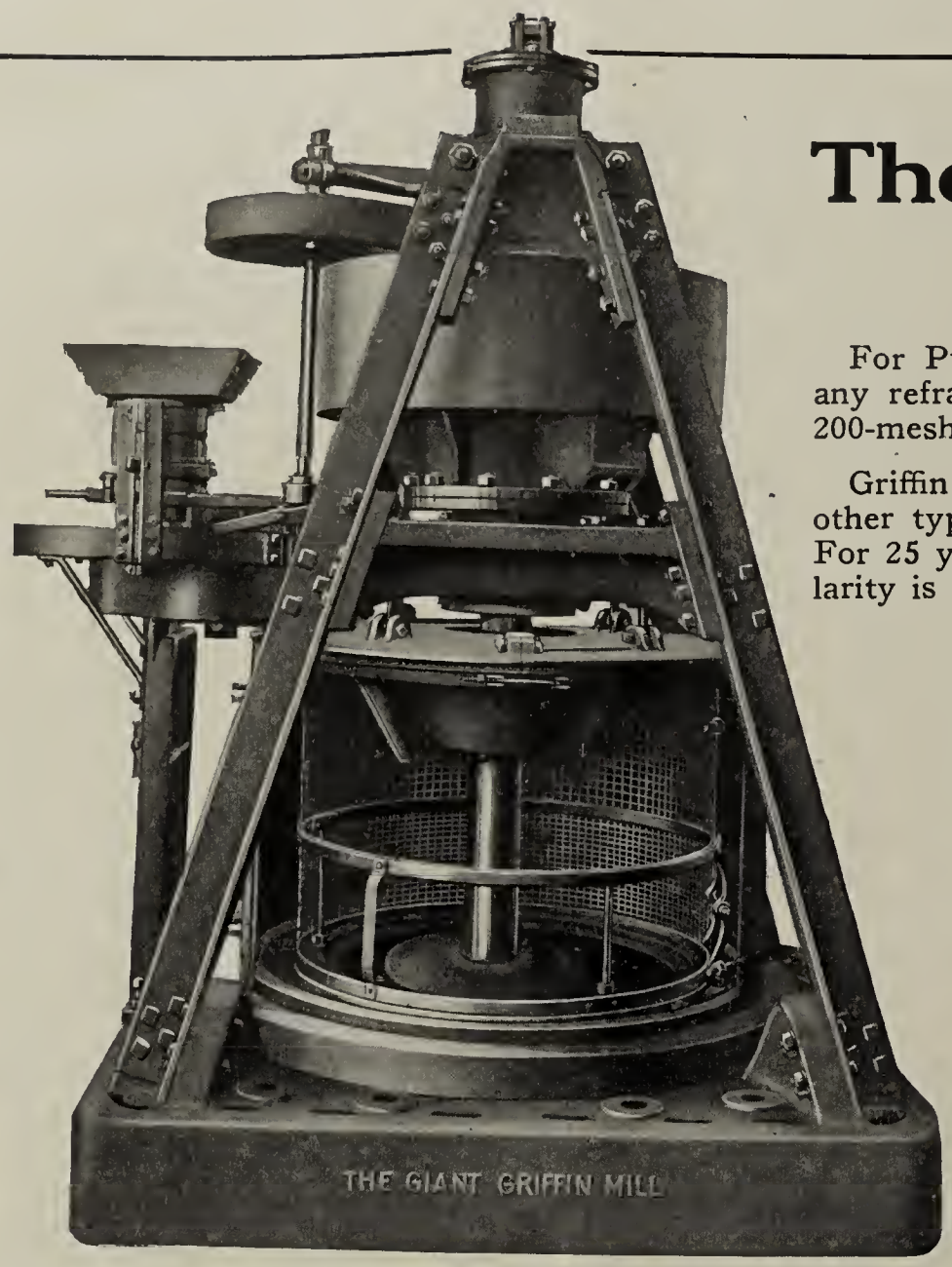


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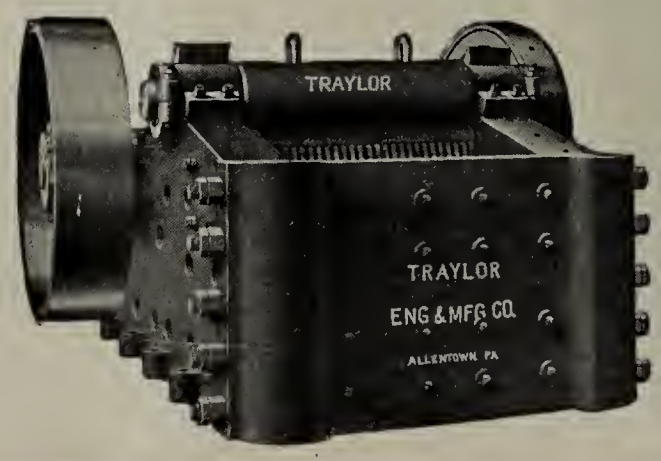

# Cement and Engineering News

Vol. 30 June 1918 No. 6

## ROCHESTER, N. Y., CONCRETE SEWAGE TREATMENT PLANT

There are six Imhoff tanks, in two sets of three each, which have sloping bottoms. The outside walls are two feet thick. A concrete of moderately dry consistency (28 gallons of water per cubic yard) had to be used on the bottoms, and the side walls were poured with a concrete of wet consistency (35 gallons of water per cubic yard).

The entire structure is waterproofed by the integral method. Mr. Poole, chief engineer, was very anxious that the concrete should be uniformly waterproofed. It was decided that six pounds of waterproofing paste per cubic yard was sufficient for this job. The mixers used were (Jaeger) ¾ yard capacity. The plant was designed under the supervision of E. A. Fisher, city engineer, and the late Emil Knichling, consulting engineer. The construction was under the immediate charge of C. Arthur Poole, general assistant engineer for the sewage plant. Myers & McWilliams were the contractors.

# CEMENT AND ENGINEERING NEWS

with which Gravel & Stone Magazine is incorporated

(PUBLISHED MONTHLY)

**WILLIAM SEAFERT, Editor and Publisher**

Office—672 Transportation Building, Chicago

Telephone, Harrison 5397 Cable Address, "Seaferts" Chicago

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## CHICAGO, JUNE, 1918


# More Economic Use of Concrete Advocated

After the invention of the rotary kiln it did not require many years for the manufacture of Portland cement to settle down to standard methods. For fifteen years practically no change has taken place in the process of production of cement. During this period our aim had to be directed towards properly using the standard article cement. Concrete construction began to amply occupy our time and necessitated many laborious tests and experiments before we could feel safe, and before the rather too frequent failures diminished in number. Recently many of us began to think that also concrete construction had settled down to standard methods by this time and that the future did not hold anything radically new in store for us.

However, times change and often compel us to look at things from a different viewpoint. What only a short time ago was considered good practice in many lines of construction becomes obsolete and impracticable in the light of present day economy.

The contributions of Wig and Ferguson of the past eight months (Engineering News-Record, September, 1917, to March, 1918) have opened our eyes to the dangers confronting us whenever we heedlessly apply the experience gained in reinforced concrete construction to sea-water construction. This was the first surprise to most of us, which calls for a complete revolution in our methods of marine construction.

A second revelation is that cities like Boston change their building code relating to concrete construction after having found their present methods to be antiquated. They are setting a good example which, we hope, many other cities will follow. As a great deal of important concrete work has been done in Boston, in charge of men of international reputation, their criticism must be highly welcomed, and some good must be expected to be derived from their decisions.

The latest news, constituting the third great surprise, is that the research laboratories of our colleges begin to advocate the use of concrete with a minimum of water. Duff A. Abrams throws down the gauntlet to the builder and tries to convince him that the present method of depositing concrete in pea-soup form is rather wasteful.

At the first glance, the advocation of dry concrete seems to contain an element of novelty to many of us, because there are only a few left who witnessed, or who remember, the continuous argument between the European concrete user and the American builder during the early days of concrete construction in this country. The European engineer would invariably recommend dry concrete and ram the concrete into the forms, for the very reason that Mr. Abrams now recommends, namely because the mixture with a minimum of water makes the densest and consequently the strongest concrete. But none of the innumerable discussions and papers read on the subject by English, French or German contracting firms doing business in this country could convince the American engineer of the necessity or advisability of using dry concrete. His argument invariably ended in favor of wet, sloppy concrete, because it could be deposited in a shorter time. Everything had to give way to speed, with the result that, as Mr. Abrams puts it, practically all faulty concrete work could be traced to too much water.

Economy is the watchword of the hour. Mr. Abrams, therefore, has a good chance to convince the American builder who now will be compelled to give dry concrete a fair test. He will discover that it may take a little longer to do the work, but that cement can be saved, or that the same amount of cement as formerly used will result in far more substantial construction; and he will finally adhere to the new method.

If the Research Laboratory of the Lewis Institute should succeed in accomplishing this, it may justly be proud of having rendered a valuable service to the country.

# Navy Buys Four Concrete Vessels

The Bureau of Construction and Repair of the Navy Department awarded a contract to the Ambursen Construction Co., 61 Broadway, New York City, for the construction of four reinforced concrete fuel oil and coal barges to be used in New York Harbor.

This is the first official recognition that the Navy Department has given of the adaptability of reinforced concrete to ship construction. The requirements for these vessels are extremely severe. The Navy Department considered a variety of designs before selecting that of the Ambursen Construction Co. The chief difficulty was the oil-proofing of the concrete, which has been successfully provided for. It is believed that this method of construction will be found entirely suitable for oil tankers in the Gulf and coastwise service.

These vessels are designed to carry a maximum of approximately 800 tons of fuel oil in the hold, and the installation of oil pumps for handling the cargo is provided for. They are also designed for carrying the same total tonnage of coal or other cargo.

Construction of these vessels will be commenced at once at the yard of the contracting company on the Hackensack River. One of the factors in the selection of this type of vessel was the speed of construction as it is estimated that the first one will be launched within fifty days, the others following at intervals of ten days.

It is expected that the Navy Department will build a total of twelve of these vessels.

# Effect of Water on the Strength of Concrete

**Ratio of Water to Cement Found to Have More Important Effect on Strength Than Quantity of Cement or Grading of Aggregates**

By Duff A. Abrams,

Professor in Charge of Structural Materials Research Laboratory, Lewis Institute, Chicago

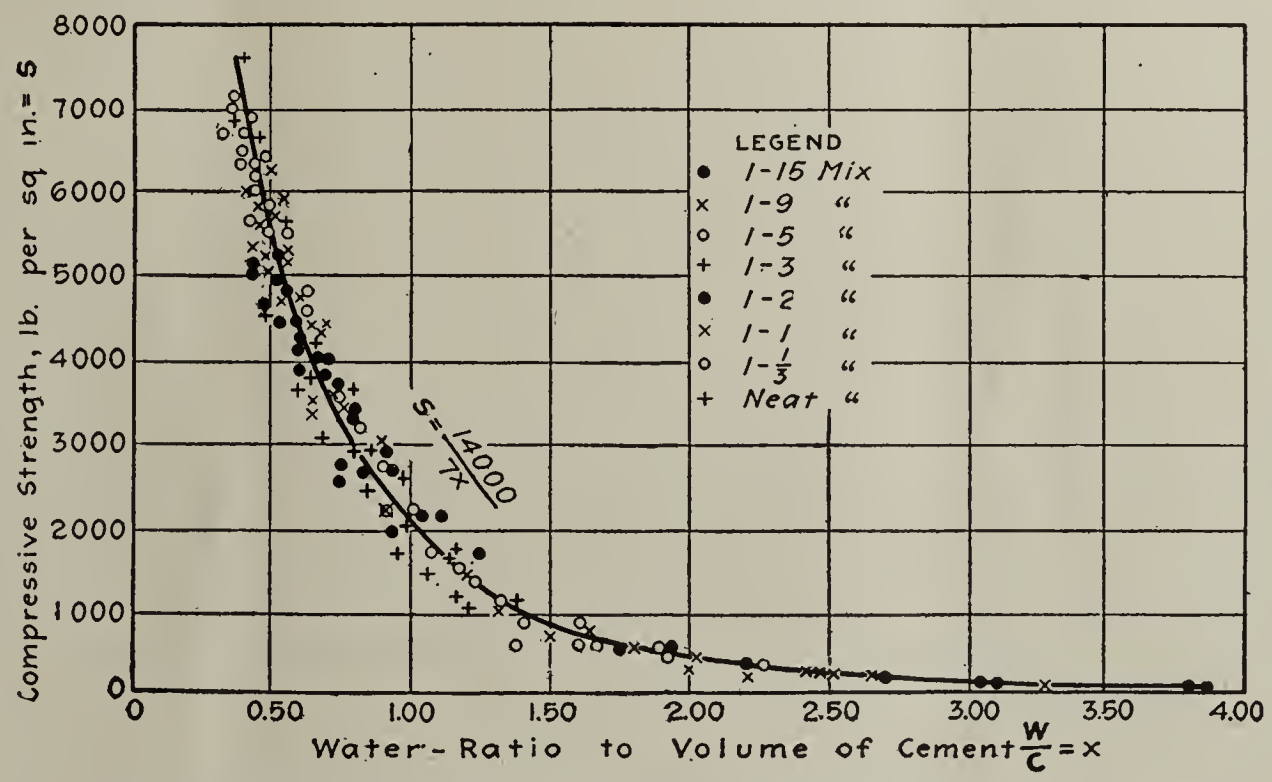
Concrete, it is commonly stated, is composed of a mixture of cement, sand and pebbles or crushed stone. This conception of concrete overlooks one essential element of the mixture—water. An exact statement of the ingredients of concrete would be: Cement, aggregate and water. The last-named material has not yet received proper consideration in tests of concrete or in specifications for concrete work.

Early users of concrete centered their entire attention on the quality of the cement, and practically disregarded the characteristics of the other ingredients. During the past dozen years some attention has been given to the importance of the aggregate, but it is only recently that we have learned that the water also requires consideration.

A great deal has been said and written recently concerning the effect of water on the strength and other properties of concrete, but the full significance of this that the truly fundamental role played by water in concrete mixtures has been entirely overlooked in previous discussions of the subject. The relation referred to above is brought out by a series of compression tests of about 166 6x12-in. concrete cylinders made up as follows:

| Mix Cement-Aggregate | Range of Sizes of Aggregates | Consistency |
|---|---|---|
| 1:15 | | |
| 1:9 | 0-14-mesh sieve | |
| 1:5 | 0- 4-mesh sieve | Different consistencies for each mix and aggregate |
| 1:0 | 0-¾-in. | |
| 1:2 | 0-1½-in. | |
| 1:1 | 0-2-in. | |
| 1:⅓ | | |
| Neat | | |

The mixes used covered a wide range, as did also the grading of aggregate and consistency. The aggregates




LEAN AND RICH MIXTURES SHOW STRIKING SIMILARITY IN STRENGTH VARIATION FOR DIFFERING WATER CONTENTS

ingredient has not heretofore been pointed out. A discussion which appeared in the April, 1917, issue of the Concrete Highway Magazine gave a brief review of results of some of the experimental work carried out along this line at the Structural Materials Research Laboratory, Lewis Institute, Chicago. The relation between the water content and the compressive strength of the concrete for a wide range of consistencies was there pointed out and emphasis was placed on the injurious effect of too much water. Tests made in studies of the effect of size and grading of aggregates have shown that the only reason concrete of higher strength and durability can be produced from well-graded aggregate as compared with a poorly-graded aggregate is that the former can be mixed with less water. If this is not done no advantage is gained from using a coarse, well-graded aggregate. The following discussion shows that a similar conclusion can now be stated with reference to a rich concrete mix as compared with a lean one.

While the injurious effects of too much water in concrete is apparent, tests made in this laboratory show consisted of two sizes of sand and mixtures of sand and pebbles graded to the sizes shown. The mix is expressed in terms of volumes of dry cement and aggregate, regardless of grading; i. e., a 1:5 mix is made up of 1 cu. ft. cement (1 sack) and 5 cu. ft. of aggregate as used, whether a sand or a coarse concrete mixture.

This series gives valuable information on the effect of changing the quantity of cement, the size of the aggregate and the quantity of water. The effect of many different combinations of these variables can be studied. One set of relations gives the effect of amount of cement using aggregates of different size and grading; another set of relations gives the effect of different quantities of water, varying both mix and size of aggregate. In all respects the tests bear out the indications of earlier and later series, and reveal the true relation between the strength and the proportions of the constituent materials in concrete. The figure shows the relation between the compressive strength and the water content for the 28-day tests. The water content of the concrete has been expressed as a ratio of the volume of cement, considering that the cement

weighs 94 lb. per cu. ft. Distinguishing marks are used for each mix, but no distinction is made between aggregates of different size or different consistencies.

When the compressive strength is platted against the water in this way, a smooth curve is obtained, due to the overlapping of the points for different mixes. Values from dry concretes have been omitted. If these were used we should obtain a series of curves dropping downward and to the left from the curve shown. It is seen at once that the size and grading of the aggregate and the quantity of cement are no longer of any importance except in so far as these factors influence the quantity of water required to produce a workable mix. This gives us an entirely new conception of the function of the constituent materials entering into a concrete mix and is the most basic principle which has been discovered in our studies of concrete.

The equation of the curve is of the form,

$$S = A/B^x \qquad (1)$$

where S is the compressive strength of concrete and x is the ratio of the volume of water to the volume of cement in the batch, A and B are constants whose values depend on the quality of the cement used, the age of the concrete, and curing conditions.

This equation expresses the law of strength of concrete so far as the proportions of materials are concerned. It is seen that for given concrete materials the strength depends on one factor only—the ratio of water to cement. Equations which have been proposed for this purpose contain terms which take into account such factors as quantity of cement, proportions of fine and coarse aggregate, voids in aggregate; but they have uniformly omitted the only item which is of any importance, the water.

The relation given above holds so long as the concrete is not too dry for maximum strength and the aggregate not too coarse for a given quantity of cement; in other words, so long as we have a workable mix.

For the conditions of these tests, equation (1) becomes,

$$S = 14{,}000/7^x \qquad (2)$$

Other tests made in this laboratory have shown that the character of the aggregate makes little difference if it is clean and not structurally deficient. The absorption of the aggregate must be taken into account if comparison is being made of different aggregates.

In certain instances a 1:9 mix is as strong as a 1:2 mix, depending only on the water content. The strength of the concrete responds to changes in water, regardless of the reason for these changes.

It should not be concluded that these tests indicate that lean mixes can be substituted for richer ones without limit. We are always limited by the necessity of using sufficient water to secure a workable mix. So in the case of the grading of aggregates. The workability of the mix will in all cases dictate the minimum quantity of water that can be used. The importance of the workability factor in concrete is therefore brought out in its true relation.

The reason a rich mix gives higher strength than a lean one is that a workable concrete can be produced by a quantity of water which gives a lower ratio of water to cement. *If an excess of water is used we are simply wasting cement.* Rich mixes and coarse, well graded aggregates are necessary as ever, but we now know just how these factors affect the strength of the concrete.

Practical use may be made of the curve in estimating the relative strength of concretes in which the water content is different for any reason. For example, a concrete mixed with 7.5 gallons of water (1 cu. ft.) to one sack of cement (allowance being made for absorption of aggregate) gave a strength in this series of 2100 lb. per sq. in. ($x = 1.00$). For $x = 0.80$ (6 gal. of water per sack of cement) we have 3000 lb. per sq. in.; for $x = 0.75$ (5.6 gal.) 3300 lb. per sq. in. Concrete in a 1:4 mix (same as usual, 1:2:3 mix with a coarse sand) should be mixed with 5½ to 6 gal. of water per sack of cement.

*The importance of any method of mixing, handling, placing and finishing concrete which will enable the work to be done with a minimum of water is at once apparent. It now seems that practically all faulty concrete work can be traced to the use of too much water.*

These studies lead to many important conclusions with reference to such topics as tests of cement, tests of concrete containing admixtures, etc. Tests of cement from this viewpoint have been under way several weeks.

## Road Building in 1918

Road building contractors can look forward to a busy year, for all signs point to a great amount of road construction during 1918. There has been some uncertainty as to what attitude the Government would take toward road improvement, in view of the enormous expenditures for purely military purposes. A line on this policy can be obtained from a recent communication which Secretary Houston of the Department of Agriculture recently made to the American Association of State Highway Officials.

"So far as it is practicable to do so," according to Secretary Houston, "this department will urge the maintenance of the highways already constructed; the construction and completion of those highways which are vitally important because of their bearing upon the war situation or for the movement of commodities; the postponement of all highway construction relatively less essential or not based upon important or military or economic needs. The department is preparing to suggest to the state highway departments the preparation of a schedule of work for the federal aid projects for 1918 in line with this policy."

Acting upon this policy the Office of Public Roads of the Department of Agriculture has sent out schedule forms, on which the States are requested to set forth the proposed federal aid work for the 1918 working season. Included in the data called for by these schedules are: Descriptions of each road; the character, quantity and railhaul of the material to be used; the probable total cost; the amount of federal funds desired; the specific purpose of the improvement; its bearing upon the war situation, and a statement as to what would be the effect of delaying the work until 1919 or later. According to a statement by the Department of Agriculture, while it is impossible to make any definite announcement regarding the transportation of road materials, "the expectations are that the transportation situation will be improved, and that the shipment of such materials for essential projects can be made."

Meanwhile the various states are starting on most extensive road building programs. References to a few of them will show which way the wind is blowing and give some idea of the road building activity which may be looked for:

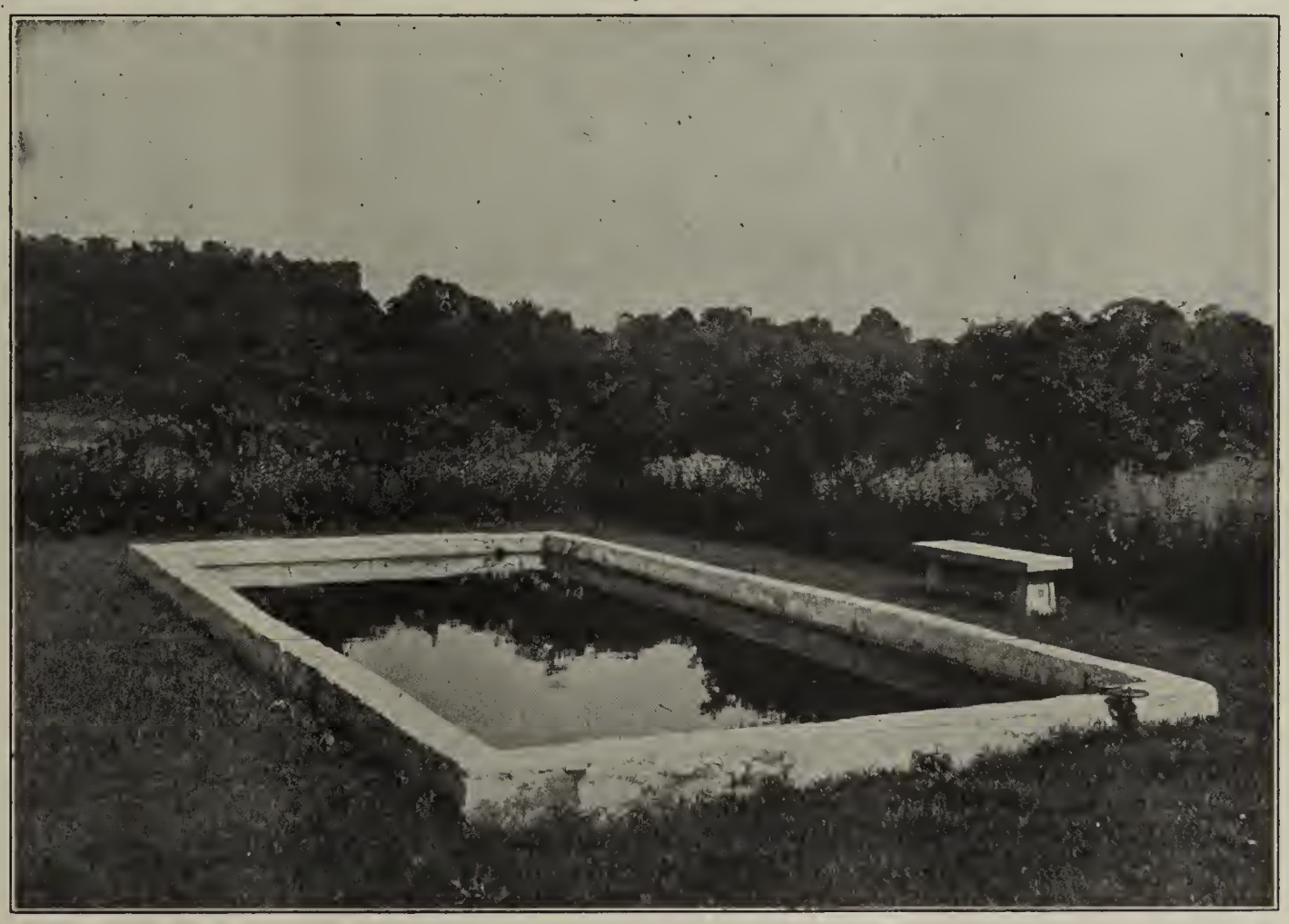
Highway improvements mapped out by New Jersey call for an expenditure of nearly $3,000,000. North Dakota is prepared to spend $3,500,000; Michigan, $6,500,000; Connecticut, $3,250,000; Pennsylvania, $9,000,000: Texas, $2,000,000; Indiana, $2,000,000; Alabama, $1.349,000. The state of Missouri has more than $1,500,000 available for road construction and ten Missouri counties recently voted bonds for roads and bridges aggregating nearly $10,000,000.

# CONCRETE SWIMMING POOLS

The rapid increase in density of population and the building up of our rural districts have eliminated to a great extent the "old swimming hole" and the many opportunities for enjoying the healthful sport of swimming. Indeed some rural and suburban communities have less facilities for aquatic sports than the city dweller plentifully supplied with indoor pools close at hand.

This condition has led to the construction of pools for small municipalities, clubs and private estates. While a swimming pool may be made costly by the provision of luxurious fitments, such as glazed tile linings, marble trimmings, heating systems for the water, ments. The accessories and fittings, as well as the size of the pool and other details, must be determined by local conditions and the amount of money available for the work.

**Construction**—The size of a swimming pool is, of course, made to conform with the space available for its site and for the number of bathers to be accommodated at one time. The minimum size for a private pool should be a length of 40 ft. and a width of 15 ft. It is desirable where possible to increase these dimensions. The depth of the water is also variable—the deep end should allow for diving, while the shallow portion must be safe for the smaller children. A depth



**Ample Pool of Neat Design.**

etc., by the omission of these items the cost of a simple outdoor pool is made extremely reasonable.

Concrete is the best material for the construction of swimming pools from the standpoints of permanence, economy and adaptability of this material to the use. It forms a water-tight, smooth, clean and sanitary pool, and may be conveniently reinforced with steel bars so as to reduce the thickness of the walls and floor. At the same time the sand and broken stone or pebbles can usually be obtained locally, and since the reinforcing is in the form of simple bars these may be obtained from a nearby supply house.

The plans and directions here given are for general conditions, and merely relate to the structural require- of 3 ft., increasing to 8 ft., is a good combination of depths.

The selection of the site is important and should be given careful consideration. The ground must be firm and well drained so as to afford a good foundation for the walls and floor. The combined weight of water and concrete in a fair-sized pool is great and if the ground does not afford a solid support there is some danger of settlement with the resulting cracking of the concrete. To resist the bursting pressure of the large volume of water and to lessen any chance of cracks, all pools should be reinforced with steel bars or heavy wire mesh embedded in the concrete. The quality and placing of the concrete, the forms used

and the method of surface finish employed, are important considerations, if water-tight, smooth, dense walls and floors are to be obtained.

**Concrete**—The proportions for the concrete should be 1 bag of Portland Cement to 2 cubic feet of sand to 4 cubic feet of crushed stone or pebbles, or what is called a 1:2:4 mix. The sand and stone must be clean, the ingredients well mixed to a mushy wet consistency and well "spaded" and tamped into the forms. By "spading"—thrusting a thin paddle between the form and the fresh concrete just placed—a wall surface free of pits and voids is obtained, as the concrete is thus compacted and settled down into its most dense volume.

**Forms**—Concrete, being a plastic material, reproduces on its surface the surface of the forms used. Regardless of the quality of concrete or care in depositing same, the resulting wall will not be smooth and dense, if the wooden forms are not planed, carefully matched and water-tight. A small leak in the forms will allow the mortar to run from the surface of the concrete with the result that an air pocket will be formed in the surface of the wall.

**Reinforcing**—Steel bars and heavy wire mesh form the simple reinforcing. The bars are easily cut to size and can be purchased in any locality. Either round, square or twisted bars may be used. Figure 1 gives the location in the wall and floor of the bars and mesh.

**Preparation of Site**—The excavation, after being carried down to the proper depth and dimensions, should be carefully examined for soft spots in the earth, which must be removed and filled with a firm material well tamped into place. If the natural drainage of the underlying soil is poor, a drain tile line around the outside line of the footings must be provided to take off any accumulating ground water.

The earth under the footings and under the floor must be thoroughly compacted by tamping and rolling. This is a very important point. Before depositing any concrete the inlet, discharge and overflow pipes are laid and connected to the proper points in the form. The discharge and overflow pipes are usually connected together and located at the deep end of the pool. The inflow pipe should be at the shallow end of the pool, in order to insure a constant flow of fresh water through the entire length of the pool. It is best to locate it just above the water line.

**Footings and Walls**—The footings and walls are constructed first. Since it will probably be impossible to construct the entire length of wall in one day, joints must be provided at the end of a day's work. These joints extend vertically through the entire wall and footings and are located midway between any two vertical reinforcing bars. In other words, a complete section of footing and walls of, say, 20 or 30 ft. in length is constructed each working day. The joint is shown in Figure 2 and it should be noted that the horizontal reinforcing bars do not extend through the joint. These joints also allow for the slight expansion and contraction of the walls caused by changes in temperature.

Concrete Swimming Pool, Saddle and Cycle Club, Foster Avenue and Lake Michigan, Chicago

In depositing the concrete in the wall sections at the deeper end, it is advisable to erect the form on the side of the wall next the earth to full height, secure the reinforcing in proper position and then place the form of the other side only part way up. This will facilitate the placing and spading of the lower portion of the material and the remainder of the form is placed when the fresh concrete nears the top of the first section of form.

Under ordinary conditions, the concrete in each section will be sufficiently hard to allow the removal of the forms in twenty-four hours, and then, by slight cutting down, the same form may be used for adjacent sections.

**Floor**—When the walls and footings are completed and the forms removed, the floor is ready to be laid. This is reinforced as shown in Figure 1 with heavy wire mesh. Four inches of concrete is deposited upon the properly prepared sub-base, the wire mesh laid in place, the remaining two inches of concrete deposited and the top screened and floated to a level surface.

If it is not possible to lay the entire floor in one day, joints are provided at the end of a day's work. A ½-in. wood strip, afterward removed, will form this joint. The resulting open joint is filled with bituminous seal filler. The mesh should not extend across the joints, but must stop at each side of same. At the junction of wall and floor a bituminous sealed joint is provided as shown in Figure 2. This is arranged by the placing of a wooden strip in the same manner as just described for the floor joints.

**Finish of Concrete**—If the depositing and spading of the concrete is carefully done with good forms, the

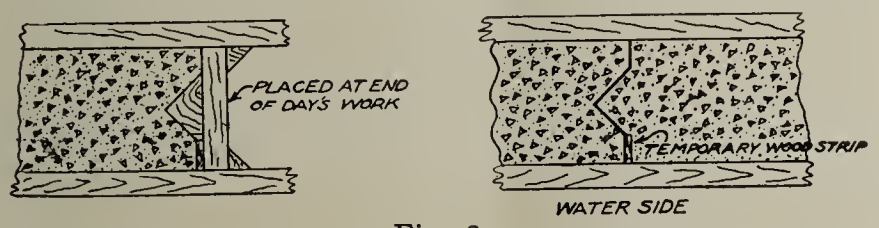



Fig. 2.
**Cross-Section of Vertical Joint in Wall at End of Each Day's Concreting. The Temporary Wood Strip Is Removed and the Groove Filled with Bitumen Sealing Compound. Reinforcing Bars E and F (See Fig. 1) Must Stop at Each Side of Every Joint and Not Extend Through the Joint.**

result should be a wall surface that is sufficiently smooth without further treatment. If there should be a few small pockets, these may be filled with a 1:2 cement mortar immediately after the removal of the forms. Such patches should be kept moist for a few days to prevent rapid drying out. When an especially smooth surface is desired, the wall may be rubbed with a piece of abrasive material (emery or carborundum) and water. It is necessary to give this treatment for about only one or two feet below the water line. No plastering of the walls with cement mortar should be permitted.

**Accessories**—The personal preference of the owner and the local conditions, of course, dictate the fittings for the pool. A springing board for diving is an almost universal requirement. Climb-out ladders or steps should be provided. Ladders may be made of U-shaped iron rods with ends embedded in the walls, or of wood hung from the top of the walls. Steps are preferable at the shallow end, since the children and more timid bathers enter at this end.

Large eye-bolts and rings fixed in the concrete above water line provide for the hand rope or rest line. An ornamental concrete bench or two, at the side of the pool, afford resting places for bathers and spectators, and are particularly appropriate as regards appearance.

In order to prevent the splashings from making the ground about the pool muddy and unsightly, it is policy to provide a concrete walk to encircle the entire pool.

The backfill of earth at the walls must be allowed to settle for several months before the walk is laid, so that there will be no further settlement to cause cracks in the walk.

As there is always a tendency for bathers to run and skylark upon this surrounding walk, it should not be finished too smooth, for it would then become slippery when wet. It is best to omit floating with a steel float and confine the finishing to the use of a rough wooden float, thus leaving the surface slightly rough in texture.

**Amounts of Reinforcing**—The table of reinforcing gives the size and spacing of reinforcing for various depths of water, while the drawings in Figure 1 give the location. In the design shown, the amount of reinforcing depends altogether upon the depth of water and is independent of the length and width of the pool. By the use of this table the reinforcing for any point in the wall can be determined, based upon the depth of water at that particular place.

Reinforcing "A" is designed to care for the pressure of the water, while "B" supports the pressure of earth when the pool is empty in winter or for cleaning. Bars "E" and "F" are horizontal temperature bars. Where bars cross, they are wired together to prevent shifting.

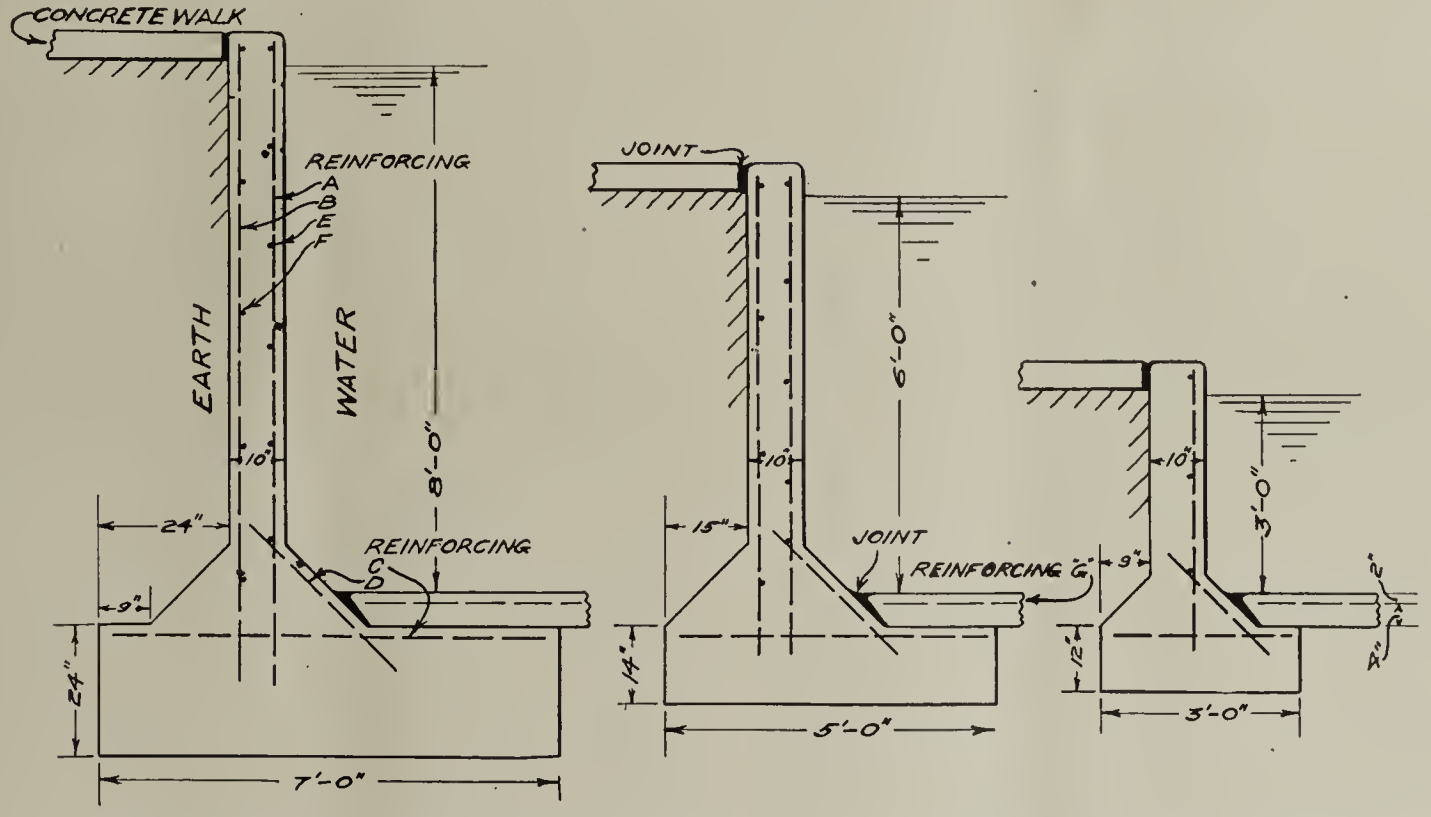



Fig. 1.
**Sizes of Walls and Footings for Depths of Water of 8, 6 and 3 Feet. Reinforcing Bars A, B, C and D Are Located 2 Inches from the Outside Surface of Concrete. For Size and Spacing of Reinforcing See Table of Reinforcing.**

Depths of water other than those given in the table should be provided for by using the sizes given for the next greatest depth of water.

**Placing Pool in Use**—After depositing the concrete, the walls and floor must be kept moist for about two weeks in order to prevent too rapid drying out. This may be done by covering the walls with canvas kept thoroughly wet, or by sprinkling the walls several times each day. The floor may be covered to the depth of an inch or two with water and the depth of the water may be gradually increased from day to day, until at the end of about twenty days the pool is filled with water. Another method of protecting the floor

from drying out too rapidly is to cover it with several inches of earth, kept moist by sprinkling at the same time as the wall.

**Lily Ponds and Wading Pools**—By applying the same construction, lily ponds or wading pools may be constructed of concrete. The depths of these smaller pools never exceed 3 feet, so that the dimensions and reinforcing given in the table and drawings for that depth may be employed.

Wading pools are often built with gradually sloping sides so that the water deepens gradually. In this case the slope is very gradual to prevent any possibility of slipping, and the wall footing and wall are eliminated. The reinforcing will then consist entirely of wire mesh, that of the floor extending on through the sloped sides. As in the swimming pool, the underlying earth must be compact and firm, so as to support the concrete without danger of cracking.

**Conclusion**—Swimming is acknowledged by all athletic trainers as one of the best exercises to keep the human body in first-class condition. Learning to swim is also an important part of the education of all. The possession of a pool, either on a private estate or by a club, increases the health and contributes to the pleasure of those using it probably to a greater extent than any other part of its equipment.

The suffering in cities, caused by intense summer heat, particularly among the children living in tenement districts, stamps the municipal wading pool as a God-send to the "kiddies."

Lily ponds add to the aesthetic beauty of public parks and private estates.

Concrete, with its feature of permanence and the fact that it requires no maintenance and yet can be so varied as to forms of structure and surface texture as to fit the requirements of the surrounding local conditions, makes an ideal material for all such structures.

**Reinforcing Table**

| Depth of water | Vertical Reinforcing "A" Size of bar | Spacing | Vertical Reinforcing "B" Size of bar | Spacing |
|---|---|---|---|---|
| 8-ft. | ½ in. square | 5¼ in. | ½ in. square | 9½ in. |
| 7-ft. | ½ in. square | 8¼ in. | ½ in. square | 14 in. |
| 6-ft. | ½ in. square | 12½ in. | ½ in. square | 20 in. |
| 5-ft. | ⅜ in. square | 12 in. | ⅜ in. square | 17½ in. |
| 4-ft. | ¼ in. round | 8 in. | none | none |
| 3-ft. | ¼ in. round | 12 in. | none | none |

Every other one of vertical bars "A" and "B" extend only one-half the height of wall.

Reinforcing "C" and "D" are of same diameter of bar and spacing as "A."

Horizontal reinforcing "E" consists of ¼-inch bars spaced 18 inches apart, regardless of depth of water.

Horizontal reinforcing "F" consists of ¼-inch bars spaced 24 inches apart, regardless of depth of water (omit for depth of water four feet and less).

Reinforcing "G" consists of mesh of a weight of at least 28 lbs. per 100 sq. ft.

# *Penn Specifications for Culverts and Short-Span Concrete Bridges*

The essential clauses of the Pennsylvania state highway department specifications for culverts and short-span concrete bridges, recently adopted, are here given.

## Foundations

The excavations for foundations shall be according to the dimensions shown on the plans and shall be carried to such depth as is necessary to secure good foundations free from all danger of damage from frost or scour. If such depth is greater than that shown on the plan, the additional concrete that may be required, shall be paid for at the price bid per cubic yard for additional concrete in foundations. Excavated material shall be deposited between the wingwalls or as the supervisors may direct.

The direction or length of wingwalls may be altered by the supervisors to suit special conditions at the site, and additional concrete that may be required, shall be paid for at the price bid for additional concrete required in the wingwalls.

If suitable foundation is found at less depth than that shown on the plan, or if the yardage of concrete is decreased by alteration of the wingwalls or by any other cause, the amount of such reduction, at the price bid per cubic yard, shall be deducted from the lump sum price.

## Piling

Where satisfactory foundations cannot be obtained 4 feet below the bed of the stream, piling may be used, and, unless otherwise shown on the plans, the spacing shall be 3 feet center to center, and the piles shall be designed to take the full load. For safe loading, the following shall be used: Safe load in pounds equals 2WH divided by S plus 1, where W equals weight of hammer, H equals fall in feet and S equals penetration in inches under last blow of hammer, but the maximum load on any single pile shall not exceed 20 tons.

After driving, the top of piles shall be trimmed of all broomed wood. The minimum projection into the concrete shall be 18 inches and the maximum 36 inches. Before concreting, all earth loosened by driving shall be removed from around the piles.

All foundations shall be inspected by the supervisors before any concrete is placed in them.

## Stone Masonry

Should it be desired to use stone masonry laid in cement mortar in the foundations, abutments and wingwalls, instead of concrete, the thickness of all such parts shall be made 10 per cent greater than those shown on plan.

Stone for masonry shall be clean, sound and durable. No stone shall be less than 6 inches in thickness unless otherwise permitted by the supervisors. No stone shall measure less than 12 inches in its least horizontal dimension, or less in a horizontal direction than its thickness. All mortar used shall be composed of one part Portland cement and three parts sand, and shall be mixed in such quantities as will insure its immediate use.

Stones shall be roughly squared on joints, beds and faces, and be laid on their natural beds so as to break joints and in full mortar beds. At least one-fifth of the stone in the face shall be headers, evenly distributed throughout the wall. All vertical spaces shall be flushed with mortar and then packed with spalls. No spalls will be allowed in the beds. Selected stone shall be used at all angles and shall be neatly pitched to true lines and laid on hammer dressed beds; draft lines may be required at the more prominent angles. Tops of wingwalls and parapets shall be capped with concrete not less than 6 inches thick which shall project 1½ inches over face of wall.

## Forms

False work for slabs reinforced with bars or rails shall be unyielding and constructed with 1 inch of camber for every 10 feet of span. For bridges constructed of I-beam stringers, the false work shall be supported from the beams.

All forms must fit tightly together to prevent leakage and be so braced that there will be no sagging or bulging under the weight of the concrete. Forms of all exposed surfaces shall be made of smooth lumber, surfaced to uniform thickness and be coated with oil or soap to prevent the concrete from adhering to them.

Forms on vertical surfaces that will be exposed to view in the finished work shall be removed in not less than 12 hours and not more than 48 hours, and the surface rubbed with clean water and a wooden float or carborundum block until it assumes a uniform sandy appearance. No painting or cement washing will be allowed.

### Concrete

All concrete shall be most thoroughly mixed. If hand mixed, the sand and cement shall first be mixed dry, then water shall be added to make mortar, then the stone which has been previously wet shall be added and mixing shall continue until all particles of stone are completely covered with mortar. Concrete shall be placed in the forms immediately after mixing.

Concrete for the abutments and wingwalls shall contain sufficient water to cause it to flatten out and quake, but not to flow.

Concrete in which steel is embedded shall contain sufficient water to cause it to flow sluggishly.

Class "B" concrete, composed of 1 part by volume of Portland cement, 2½ parts of sand and 5 parts broken stone or gravel, shall be used for foundations, wingwalls and for abutments up to clearance line of bridge.

Class "A" concrete, composed of 1 part by volume of Portland cement, 2 parts of sand and 4 parts of broken stone or gravel, shall be used for floor slabs, beam casings and parapets.

Cement shall be true Portland cement of well-known brand, which shall be subject to the approval of the supervisors, and shall conform to the standard specifications of the American Society for Testing Materials, dated January, 1909. It shall be free from lumps, caking or watermarks, and when delivered on the work shall be in undamaged packages. It shall be stored on the work in such a manner as to be perfectly protected from wet or moisture.

All cement shall be subject to inspection and test, and cement not complying with the requirements will be rejected.

Water used in concrete shall be fresh and clean, and free from sewage or acids.

### Concrete Materials

Sand shall be clean and hard grained, and shall be graded from fine to coarse, with no particles larger than ¼ inch in size. It shall be free from loam, silt or other foreign matter.

Gravel shall be composed of clean, hard particles, and be free from dirt or foreign matter of any description.

Stone shall be hard and durable, broken into approximately cubical particles, and be free from dirt or foreign matter of any description.

For Class "A" concrete: Gravel or broken stone shall be uniformly graded in size from ¼ to ¾ inch.

For Class "B" concrete: Gravel or broken stone shall be uniformly graded in size from ¼ to ½ inch.

No concrete shall be laid in freezing weather without the permission of the supervisors. For placing concrete in freezing weather the contractor shall establish a suitable plant for heating the water, sand and crushed rock or gravel. After placing the concrete the work must be thoroughly protected. Final approval of concrete masonry, laid in freezing weather, will not be given until inspected after continuous warm weather for at least 30 days.

Structural shapes shall be medium steel, manufactured by the open hearth process, and shall conform to the specifications of the American Railway Engineering Association, dated 1910.

### Reinforcing

Reinforcing steel shall be medium steel, manufactured by the open hearth process, and shall meet the requirements of the specifications adopted by the Association of American Steel Manufacturers for concrete reinforcing bars.

Reinforcing shall conform in size, form and position to the drawings, and shall be securely held in place during concreting. It shall be free from rust, dirt, grease and thick or loose mill scale.

Pipe railing shall be straight and true to the dimensions shown on the plans, and be erected in a most workmanlike manner.

Posts shall screw into fittings. Rails shall screw into end fittings and slide through intermediate fittings. The pipes shall be galvanized and all spots where galvanizing has been damaged shall be painted with aluminum paint.

Forms of concrete parapets or railing shall be constructed of desired lumber, and be erected with extreme care, and securely braced in place in order to insure the finished work being straight and true. Concrete shall be carefully spaded while being deposited. Special care shall be used in removing forms to avoid damaging the corners of the work. After removal of forms (in approximately 12 hours), the parapet shall be rubbed with a wooden float until it assumes a uniform sandy appearance, and all lines and panels are true and pleasing to the eye.

## Light Concrete Walls for Grain Elevator

Two-inch concrete walls enclose the big grain elevator of the Chicago & Northwestern Railway Company at South Chicago. The working house is 350x100 feet, and the roof is 250 feet above the ground. The frame for this structure, machinery house and the track shed is made up of light structural steel members.

About 180,000 square feet of walls were required to enclose these structures and the problem of making them light and fireproof was solved by the use of the cement gun. The walls are supported by a ledge of the concrete floors extending over the steel floor beams. The reinforcement for the walls consists of a heavy woven wire mesh which is fastened to the steel framework of the buildings by metal clips. The concrete, composed of one part of cement to three and one-half parts of sand, was applied with the cement gun under an air pressure of 35 pounds.

Wood panels, 3x9 feet, temporarily attached to the outside of the wire mesh, were used as backing for the application of 1½ inches of concrete on the inside of the walls. When the wood panels were removed, the outside surface was cleaned with water by air pressure and the finish coat, one-half inch thick, applied. The concrete on the inside of the walls was floated, but the ouside was left rough. Some surface cracks have developed in the walls due to the shrinkage of the concrete, but they do not extend through the concrete and do not, therefore, affect their solidity.

## Concrete Ships

Carl Leonhardt, president of the Southwestern Portland Cement Company, for many years one of the leading building contractors in Southern California, will embark in the shipbuilding business. He has secured a site at Los Angeles harbor and has formed a company to construct reinforced concrete ships of 5000 tons and more.

# *Cement Prices Fixed for Government Needs*

The government price-fixing committee has adjusted the relations between the cement industry and the government, bringing about, broadly speaking, an increase in prices paid by the government for cement, with the assertion that, if a disposition develops to advance this price to the general trade, the committee would be forced to establish a policy of fixing the price paid by the general public at that which is paid by the government.

It is explained in Washington that the readjusted prices have been based on federal trade reports, and that prior to May 1 the government bought cement at less than commercial prices, namely, at 30 cents less than commercial prices, 20 cents less than the dealers' price. The prices which have been fixed are to be effective for the four months ending August 3.

The following represent the new schedule of prices per barrel f. o. b. cars: Hudson, N. Y., $1.85; Northampton, Pa., $1.75; Universal, Pa., $1.75; Fordwick, Va., $1.70; Bellevue, Mich., $1.80; Mitchell, Ind., $1.70; Hannibal, Mo., $1.70; Bluffington, Ind., $1.60; La Salle, Ill., $1.70; Mason City, Ia., $1.70; Iola, Kan., $1.75; Steelton, Minn., $1.70; Kingsport, Tenn., $1.65; Richard City, Tenn., $1.65; Harrys, Tex., $1.70; Houston, Tex., $1.80; El Paso, Tex., $1.95; San Antonio, Tex., $1.95; Trident, Mont., $1.90; Portland, Colo., $1.75; Devils Slide, Utah, $1.90; Brigham, Utah, $1.90; Salt Lake City, Utah, $1.90; Irvin, Wash., $1.95; Concrete, Wash., $1.95; Oswego, Ore., $2.00; Cement, Cal., $1.95; Davenport, Cal., $1.95; Crestmore, Cal., $1.95.

Shipments in bulk 15 cents per barrel less.

Shipments in paper bags 10 cents per barrel additional.

Shipments in cloth bags 40 cents per barrel additional.

According to information obtained at the office of Richard L. Humphrey, chief of the commodities section, Council of National Defense, Washington, D. C., the government price-fixing committee passed a resolution at its meeting May 4 which was handed to the cement manufacturers as notice of the government's position in connection with maximum prices. The resolution follows:

"Whereas, the unknown quantities influencing the probable cost of cement during the four months ending August 31 are so numerous as to make it difficult to fix a maximum price which will secure to the manufacturers what the government considers a fair profit, it is understood and agreed that if at any time during said period for which maximum price has been fixed the manufacturers can submit a convincing proof to the price-fixing committee that the price agreed upon is unfair to them, the committee will receive such evidence and readjust prices from date of said submission of evidence on what the government, following its usual policy, conceives to be fair and just to the manufacturers. While the maximum price agreed upon is understood to be for the government only, the manufacturers have assured the government that the maximum price they are charging the general trade is the list submitted to the government on April 22, with the exceptions noted on attached list. The government serves notice on the manufacturers, however, that if there is any disposition to advance this price to the general trade, the government will enforce the established policy of the government where it fixes a price for the government and the public, for the general public to pay the same price which the government pays."

During the period from January 1 to May 1, the government was buying less than 5 per cent of the cement production of the country, but the demand has steadily increased because of the growing necessity for using concrete in construction as a substitute for steel, which cannot be obtained in sufficient quantity in the present state of the market.

The members of the government price-fixing committee are R. S. Brookings, chairman; B. M. Baruch, chairman of the War Industries Board, ex-officio; Hugh Frayne, representing labor; H. A. Garfield, representing the fuel administration; F. W. Taussig, representing the Tariff Commission; Lieut. Col. F. S. Young, representing the Army; Commander John M. Hancock, representing the Navy; W. V. Colver, representing the Federal Trade Commission, and H. B. Ingalls, acting secretary.

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## Traylor Engineering & Mfg. Co. Elects New Officers

At a meeting of the Board of Directors of the Traylor Engineering & Manufacturing Company of Allentown, Pa., held on April 16th, Mr. S. W. Traylor resigned the Presidency and Mr. W. J. Roberts was elected in his stead. Other changes effected were the election of Mr. Traylor to the Chairmanship of the Board of Directors, and Mr. Harry Battersby, who was previously Treasurer of the Company, was chosen as first Vice President and Treasurer. Mr. F. R. Crispen, Secretary, was retained in his present position, and Mr. H. L. Miller and Mr. Richard Berdhard were added to the Directorate.

In addition to the Chairmanship of the Board of Directors of the Traylor Company, Mr. Traylor still occupies the positions of President and General Manager of the Traylor Shipbuilding Corporation of Cornwells, Pa., and President of the Cement Gun Company, Inc., both of which are subsidiaries of the Traylor Engineering & Mfg. Company.

Mr. W. J. Roberts has been connected with the Traylor Company for twelve years, having advanced from step to step through its entire organization, and his election to the Presidency of the Company will be most welcome news to his many friends. He is particularly well known in all the metal mining districts throughout this country and Mexico and his personal acquaintance is of a most extensive character.

The election of Mr. H. L. Miller and Mr. Richard Bernhard to the Directorate will appeal strongly to the many users of machinery. Mr. Miller has, in addition to being made a director, been appointed General Manager of the Company, a position for which he is exceptionally qualified, on account of his long experience as General Superintendent and Asst. General Manager of the Power & Mining Machinery Company of Milwaukee. Mr. Bernhard occupies the position of Chief Engineer, the same that he held with the Power & Mining Machinery Company previous to his connection with the Traylor Company about one year since.

The Traylor Company has within the past year completed very extensive additions to their plant, the new machine shop being considered one of the model buildings of this type in the country. In addition to the manufacture of mining and crushing machinery, in which they have specialized for many years, and in which they have been so successful that at the present time 85% of all the furnace equipment used in smelting gold, silver, lead and copper is made at their plant, the Traylor Company have recently taken on the manufacture of Marine Engines and Boilers and have achieved the honor of completing the first engine for the new Mercantile Marine now being pushed to completion by the U. S. Shipping Board. Traylor Crushers and Rolls have always been the standard, and the success of Robert's intimate knowledge of this work and his energy in pushing same.

The Company proposes after the War to continue in the manufacture of ships and shipping machinery, and due to the close affiliation to the Traylor Shipbuilding Corporation will be able to turn out complete ships.

## Ideal Engine Company Secures the Services of Mr. L. A. Ferguson

L. A. Ferguson, former manager of the Eureka Machine Company, of Lansing, Mich., has become associated with the Ideal Engine Company of the same city as special representative, according to an announcement made by General Sales Manager C. S. Smith of the Ideal Engine Company.

Mr. Ferguson had been connected with the Eureka Machine Company ten years, and previously conducted a machine shop in Jackson, Mich. He has always been closely associated with construction work and will be active in the distribution of Ideal engines, which furnish power for the operation of concrete mixers, power loaders, hoists, pumping outfits, spraying machines and various other equipment used by contractors, manufacturers and farmers.

Mr. Ferguson is well acquainted with contractors and builders of contractors' equipment throughout the United States, and thoroughly understands the manufacture of concrete mixers, power loaders and contractors' equipment.

According to Sales Manager Smith, the business of the Ideal Engine Company continues to grow every month, and it is because of the increasing volume of

L. A. Ferguson.

sales that Mr. Ferguson is joining the company's executive department.

"While our sales of Ideal engines to builders of concrete mixers are not expanding—due to the general falling off in construction work throughout the country—Ideal engines are furnishing power in so many other new lines that it has been necessary to operate our plant to full capacity to keep pace with the demand," said Sales Manager Smith.

"Ideal engines are being used in government work here as well as abroad, and according to the reports we have received are giving dependable, never-faltering service."

Mr. Smith and Mr. Ferguson are both of the opinion that Ideal engines of large size should find a ready market for furnishing power for machines operated in the past by steam.

"Federal officials have placed orders for all the boiler plate that steel mills can produce," said Mr. Smith, "and deliveries to other sources have been cut off.

"Builders of machines which formerly were operated by steam engines are now forced to accept a substitute in self-defense. And they are discovering that gasoline engines are not only more economical from an operating standpoint, but the first cost is much less. Ideal engines have been developed to such an extent that they are reliable and dependable and of course they are much lighter and easier to handle than steam engines of the same horse power.

"Then, too, Ideal engines do not require the service of a licensed engineer—a necessary expense with the steam engine.

"There are many advantages in favor of the gasoline engine over the steam engine—advantages that builders of machines always operated by steam in the past are just taking cognizance of for the first time. And I believe that when normal conditions return, the gasoline engine will be so firmly entrenched as a power furnishing unit that it will never be replaced by the steam engine in many lines of industry."

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## Opportunity for Tile Factory

Blissville, Arkansas, is coming to the front very fast in an agricultural way, with soil of the very highest type, but badly in need of drainage, held back entirely due to the fact that tile is too expensive on account of excessive freight charges, from the fact that tiling companies are located so far distant.

There is going to be very shortly a large field for marketing farm tiling, and we believe that an enterprise of that kind will be financially successful. At the same time there is a large body of good tiling clay well located for serving a large territory.

We also believe that the proper person can secure financial assistance for embarking in an enterprise of that kind, and would thank you to place this information before your readers.—Yours very truly, Bliss-Cook Oak Company, Blissville, Ark.

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## Water Regulator and Meter for Concrete Mixer

An automatic water regulator and meter to be attached to concrete mixers has been put on the market by the Anderson Meter Co., Providence building, Duluth, Minn. It has been successfully used during the past season on work in that city. The device is in effect a centrifugal pump with metering attachment. It can, therefore, be used either as a pump, when motor driven, to fill tanks, sprinkle concrete, etc., or as a regulator of the supply to the mixer. It is operated by throwing a lever, the process thereafter being automatic. Desired amounts of water can be set on the gage and the regulator cuts off at the proper point. The device weighs about 75 pounds, is 12-inch diameter, and can gage automatically from one to twenty gallons of water.

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## Cement Price Raised From $2.00 to $2.40

Northampton, Pa., March 23.—At a conference yesterday of the representatives of the big Portland cement mills and Government officials, the price of cement was raised from $2 to $2.40 a barrel at the mills, with a differential of 10 per cent in favor of the Government. Only a few years ago cement was 55 and 60 cents a barrel, but at that time coal was but 60 cents a ton and labor as low as $1.15. The manufacturers at that time made as much or more than they will at the new figure, with labor getting 30 to 32 cents an hour and coal four and five times the old figure.

# *High Drum 'Non-Tip' Boss Lincoln Highway Pavers*

The modern improvements in paver design and construction which meet the demands of the paving contractor for higher efficiency and greater economy are well illustrated by the improved types of Boss Pavers.

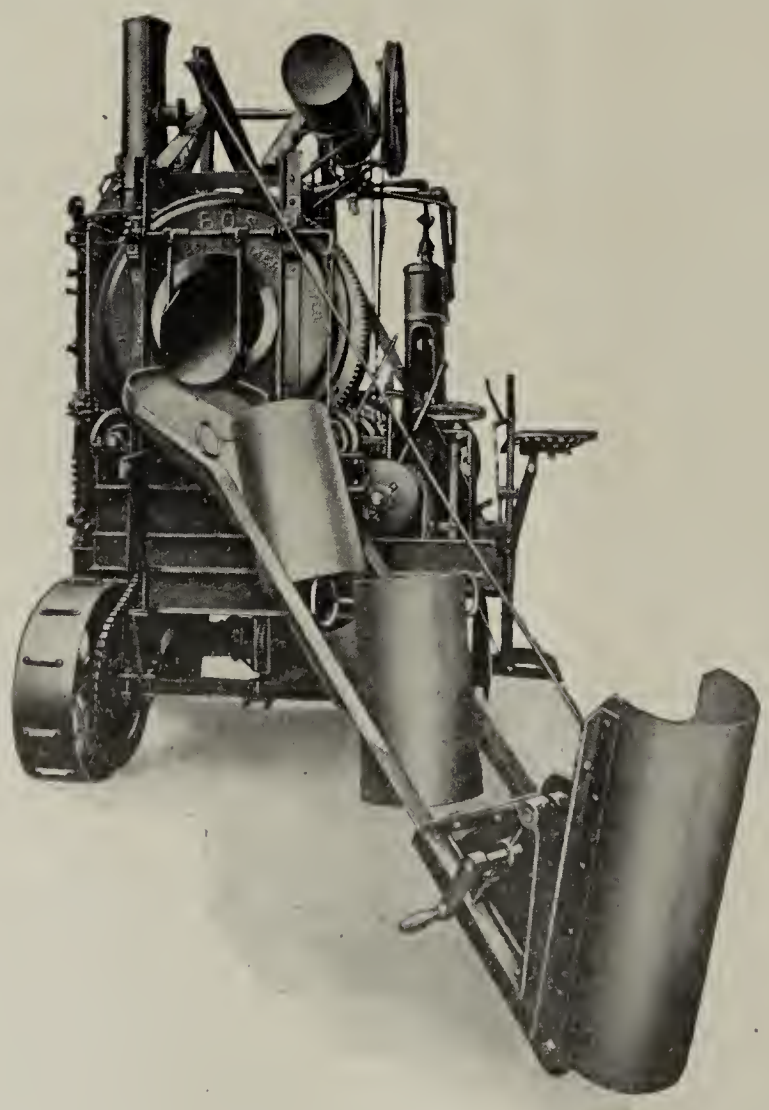
These machines—known as Lincoln Highway Pavers—embody all the latest practical and successful improvements and refinements in up-to-date paver construction. They meet the requirements of all sorts of paving jobs to the satisfaction of a large number of users. They are lighter and far stronger than old-style pavers—turn out more and better concrete in less time and with less expense for labor.

Lincoln Highway Pavers are built practically entirely of steel. They stand up for the hardest service without breakdowns and delays. One man handles them—all operating levers are banked within easy reach. They offer the contractor his choice of gasoline, kerosene, steam or electric power, and the gasoline and kerosene machines have demonstrated the fact that they are as reliable as steam. They are actually about $10 a day cheaper in operation.

These pavers are all equipped with Hyatt Self-Oiling Roller Bearings, Novo or Ideal frost and dust-proof engines with high tension magnetos, Automatic Power Charger, Measuring Pressure Water Tank, 14 feet Chute, Two way traction.

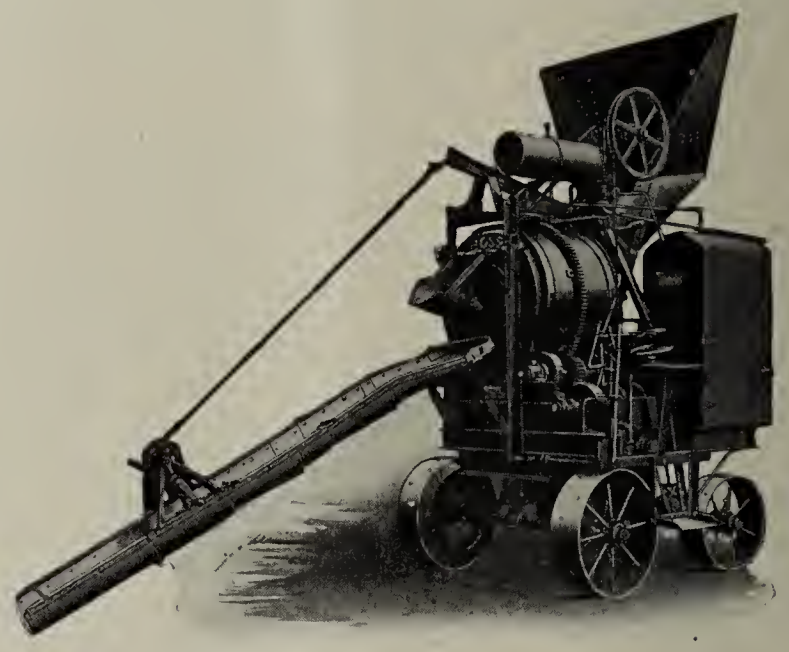
### Non-Tip Feature

Lincoln Highway Pavers are all built with high drums—bottom of discharge spoon six feet from the ground. Danger of tipping is eliminated by specially wide track and wide tires—machine will not tip. The high drum gives steep pitch to the chute which swings from curb to curb. Chute is sectional—with three gates—and



allows dumping of concrete right up to the paver. This means less moving of the machine and less time lost.

Boss Lincoln Highway Pavers are manufactured by the American Cement Machine Co., Inc., at Keokuk, Iowa. The Boss factories are located within a stone's throw of the great 300,000 horse power hydro-electric dam and are operated by electricity. In addition to pavers the company manufactures a full line of mixers in all used sizes and for all purposes—also grouters,



**Boss Lincoln Highway Pavers.**

hoists, pumps, backfillers, material elevators and concrete carts. Their 1918 catalog, illustrating and describing the complete line, will be mailed to any contractor interested upon request.

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## Manufacturing Burial Vaults

The manufacture of Automatic concrete sealing vaults is now in full swing at the plant of the Eau Claire Concrete Company, Eau Claire, Wis. The first vault was completed at the Main Street factory yesterday. It is expected by the management that they will be able to complete two of these vaults each week. After they are finished they are left in the forms (furnished by the Automatic Sealing Vault Co., 216 East River street, Peru, Ind.) for three days and then the forms are removed and the concrete is given four days to dry. The vault is made of waterproof cement and is reinforced with strap iron. At burial the vault is lowered in the grave and at interment the casket is then placed within the vault. After this the cover is placed on the vault and by an automatic process fastens itself securely over the vault proper. This makes the vault air tight and water proof.

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## Convention of American Concrete Institute

The 14th Convention of the American Concrete Institute which was scheduled for last February was postponed until June on account of the severe traffic conditions at that time. The dates have now been decided upon and the Convention will be held June 27-28-29th at Hotel Traymore, Atlantic City, N. J.

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## New Cuban Cement Mill

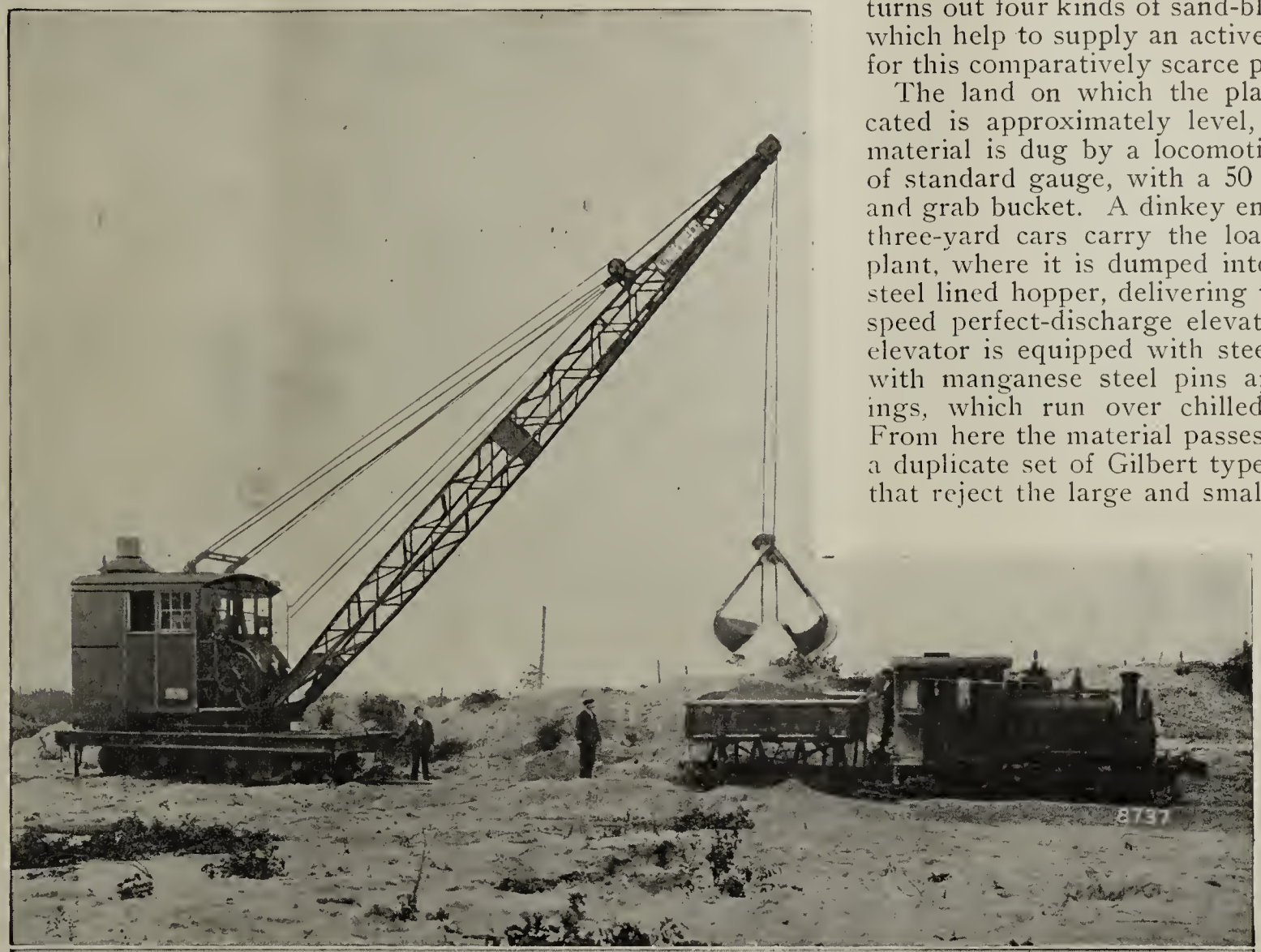
The Cuban Portland Cement Company is now producing 800 barrels of cement a day, and it is expected that within three months the plant will be producing at its maximum capacity of 2,000 barrels a day. It costs the company from $2.50 to $2.75 per barrel of output, and it is selling cement at $4.75 net per barrel. This means $2 per barrel profit, or $4,000 per day on a capacity basis.

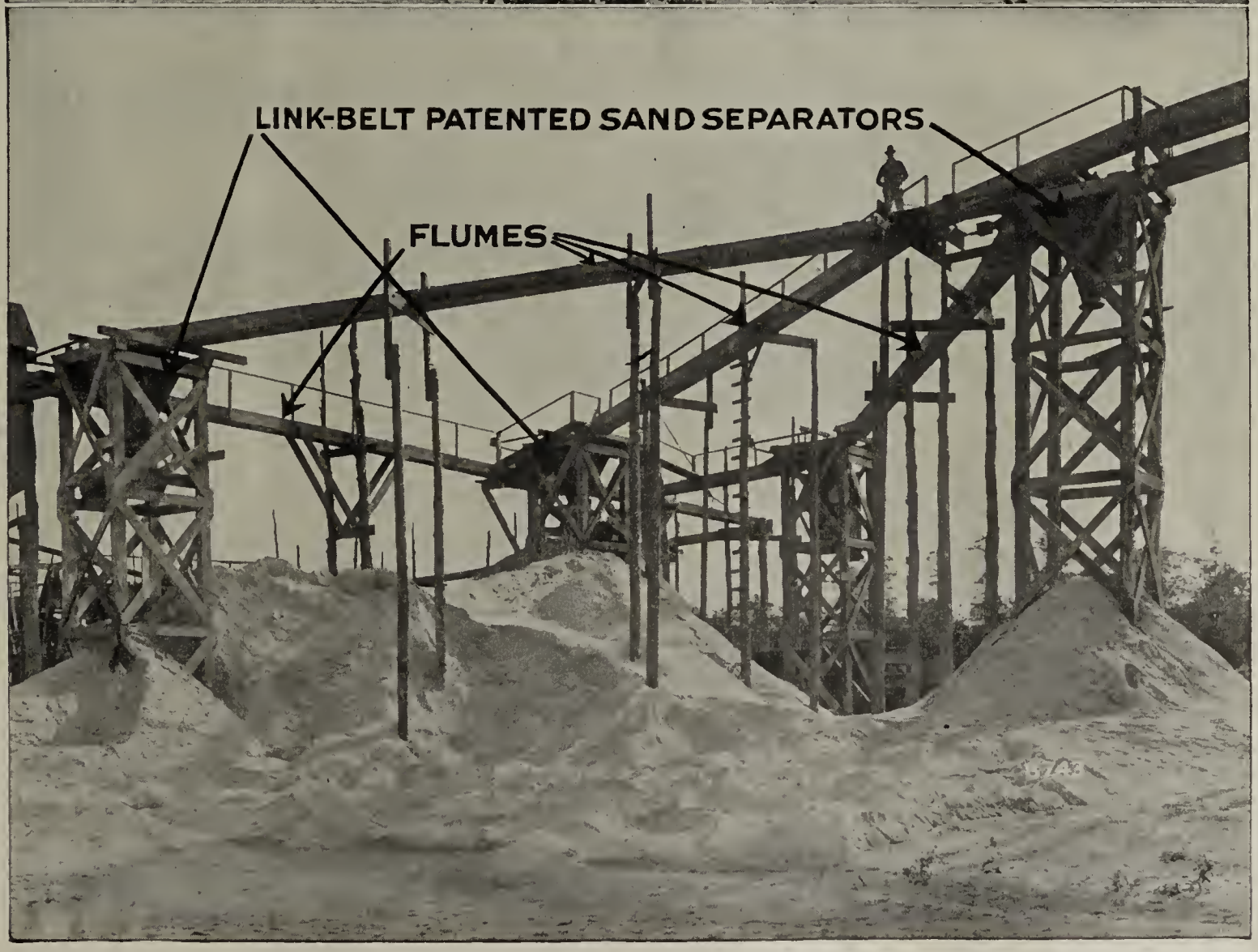
# *New Modern Plant of The Absecon Sand Company*

The Absecon Sand Company, Absecon, N. J., has recently completed a plant, which, through its differences from the usual run of plants for the same kind of work, should be of interest to the trade in general.

The Absecon Sand Company produces a high grade of pebbles and sand for concrete work, and in addition turns out four kinds of sand-blast sand, which help to supply an active demand for this comparatively scarce product.

The land on which the plant is located is approximately level, and the material is dug by a locomotive crane of standard gauge, with a 50 ft. boom and grab bucket. A dinkey engine and three-yard cars carry the load to the plant, where it is dumped into a large steel lined hopper, delivering to a low-speed perfect-discharge elevator. The elevator is equipped with steel chains, with manganese steel pins and bushings, which run over chilled wheels. From here the material passes through a duplicate set of Gilbert type screens, that reject the large and small pebbles



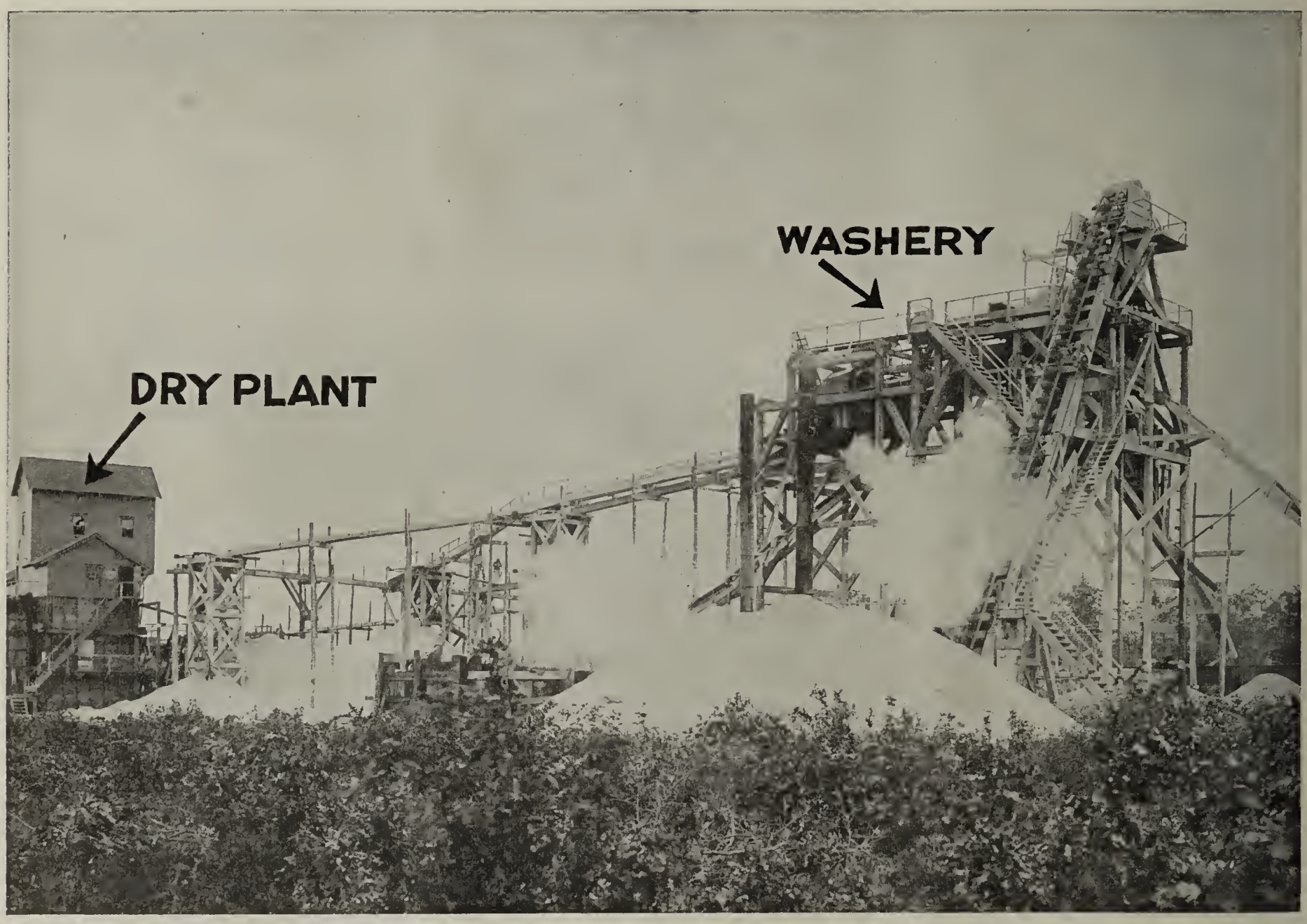



The Machinery, Screens, Etc. Are Mounted on a Trestle Work About 50 Ft. High and All Storage of Materials Is in the Form of Ground Storage, Which, When Required, Can Be Reclaimed and Loaded to Cars with the Locomotive Crane.

and torpedo gravel, and deliver to the separators, and to storage piles of coarse and fine sand. In order to wash the larger pebbles completely, to meet the requirements of concrete specifications, a gravel scrubber is also used at the rejection point of the first pair of screens.

The washing plant, with its sand separators or settling tanks, is unique in having no storage bins. The machinery, screens, etc., are mounted on a trestle work about 50 ft. high, and all storage of materials is in the form of ground storage, which, when required, can be reclaimed and loaded to cars with the locomotive crane.

The advantage of this type of plant over the usual bin construction is its elasticity; in other words, in the case of a bin construction plant, if the torpedo gravel, for instance, is moving slowly, and the bin for this size




The Washing Plant, with Its Sand Separator or Settling Tanks, Is Unique in Having No Storage Bins.

is full, the plant has to shut down until shipments of torpedo have been made, to make room for more.

In this plant, the pebbles, torpedo gravel and concrete sand can be delivered direct to cars by means of chutes, or, by the throwing of a flap gate, delivered to the storage piles. The amount of ground storage available immediately under the plant amounts to over 25,000 yards.

The power used is steam, a single engine and two boilers supplying the power necessary to drive the elevator, and turning the screens and operating a steam driven pump, which circulates the washing water. This equipment has a capacity of 120 tons per hour, and the arrangement of the machinery is simple, with the fewest number of moving parts, to reduce the cost of maintenance.

The arrangement of sand separators or settling tanks is such that, on one day sand is delivered to a ground storage pile near the drying plant, and the next day to another pile, also near the drying plant. By alternating in this way each sand pile is allowed to drain for 24 hours before it passes into the dryers.

The dryers are loaded by means of two Clark type power shovels delivering to two small elevators, which, by proper proportion of the buckets, put into each dryer the correct amount of sand for the capacity of the plant. The dry sand passing from the dryers is elevated by a centrifugal discharge elevator to a combination of Reinert vibrating screens, which separate the sand into numbers 1, 2, 3 and 4 standard sandblast sands, and also take out the fines, which are used for engine-sand and similar work.

The finished product is kept in a water tight building, in ground storage bins, six in number; from which three elevators, operating independently, again pick up the finished sand and deliver it to the doors of box cars in which it is shipped.

The general arrangement of the plant in regard to tracks, sidings, etc., is such as to insure, for years to come, the digging of material with a minimum shifting of track; and at the same time the grading of the tracks is such as to allow the crane or the dinkey to move all loaded and empty cars independently of the railroad shifting engine. This plant was designed and equipped by the Link-Belt Company, of Philadelphia.

## Chemist at Cuba Cement Plant

P. Boberg, formerly chief chemist at the Hawkeye Cement plant, Des Moines, Ia., is now in Cuba, having taken a position with the Cuban Portland Cement Company.

# Cost of Constructing Concrete Pavement at Savannah, Ga.

During 1916 the city of Savannah, Ga., laid 31,500 sq. yd. of 1-course concrete pavement. This work was carried out under the direction of Mr. E. R. Conant, chief engineer of the city. Detailed costs of the improvement are given in the annual report of Mr. Conant, from which the matter in this article is taken.

The concrete was a 1:1½:3 mixture; the average thickness of the pavement was 6¼ in. The concrete was mixed in an Austin mixer. At least one minute in the mixer was allowed for each batch. Grade pegs were set for 6 ft. squares, and the consistency of the concrete was such that shovels only were used for grading the concrete between the pegs.

Joints were formed by using boiler metal plates with tarred paper between, the plates being withdrawn after the next section had been carried far enough forward to hold the tar paper straight in place. The concrete was still fresh enough to fill the crevices left by the withdrawal of the steel plates. The paper stood 1 to 1½ in. above the surface. This extra paper protects the edges of the concrete slabs until they secure practically full strength, before the traffic crushes the paper completely.

The prices of the materials delivered on the work were as follows:

Cement, approximately, ⅓ at $1.63 per bbl.; ⅔ at $1.75 per bbl.

Crushed stone, approximately, ⅓ at $2.64 per cu. yd.; ⅔ at $2.68 cu. yd.

Sand, approximately, ⅓ at 70c per sq. yd.; ⅔ at 80c per cu. yd.

Tar paper, extra size, joints at 74 to 96 ct. per roll.

Coal at $3.60 per ton.

Lumber at $20.00 per M.

White labor was used in the work, the gang consisting of a foreman at $4 per day, 20 men at $1.75 and 10 men at $1.50 per day. The working day was 9 hours. The number of teams used varied from 6 to 1. One-mule teams were employed at the rate of $1.50 per day.

The cost in cents per square yard for each item was as follows:

| | Ct. per sq. yd. |
|---|---|
| Labor— | |
| Watchman | 1.654 |
| Grading | 8.678 |
| Handling cement | 0.615 |
| Handling sand | 2.675 |
| Handling crushed stone | 3.756 |
| Spreading concrete | 2.248 |
| Operating mixer | 3.908 |
| Finishing surface | 1.346 |
| Making expansion joints | 0.532 |
| Covering pavement | 0.688 |
| Moving equipment | 0.597 |
| Cleaning up | 2.014 |
| Removing trees | 0.222 |
| Resetting curb | 0.107 |
| Total labor | 29.040 |
| Hired Teams— | |
| Grading | 1.461 |
| Moving equipment | 0.122 |
| Cleaning up | 0.417 |
| Covering pavement | 0.062 |
| Total teams | 2.062 |
| Materials— | |
| Cement | 56.075 |
| Sand | 5.646 |
| Crushed stone | 39.216 |
| Expansion joints (2-ply tar paper) | 0.884 |
| Coal | 0.412 |
| Tools and hardware | 1.896 |
| Lumber | 0.290 |
| Miscellaneous | 2.158 |
| Total materials | 106.577 |

# An Improved Pumping Outfit

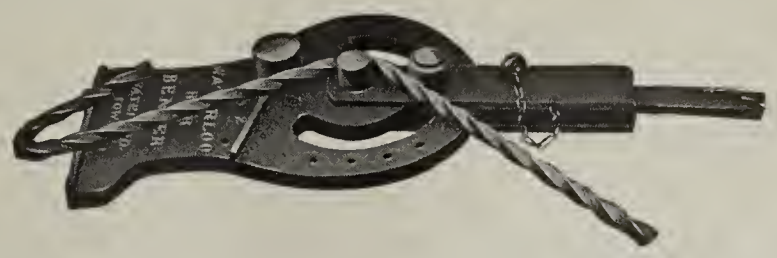
The pump illustrated on this page pumps more water at less cost than other pumps, the manufacturers declare: "You can pump from 1500 to 8800 gallons of water per hour with base submerged or with suction hose giving maximum head of 40 ft., with an Evinrude

The Evinrude Centrifugal Pump.

unit centrifugal pump." It has large unobstructed passages and is made in two sizes—driven by the famous Evinrude motor—known especially for its dependable power and easy, quick action. Over 90,000 now in use. Cement & Engineering News, 672 Transportation Bldg., will gladly send interested parties catalog, prices and information.

# Concrete Bar Bender

The Waterloo bar bender illustrated herewith has been on the market for six years and is being used successfully by many thousands of contractors throughout the country. The price of this bender is returned to you in time and money saved on your first job, and the machine itself is indestructible, so you multiply this saving year by year.



Makes bends at various angles to meet any design. Bending posts of turned steel. The post that revolves through the slot in the plate is equipped with loose steel roller to keep bar from creeping during bending. Machine is furnished with detachable handle 7 feet long. No. 2 machine is especially adapted for field work. Cement and Engineering News, 672 Transportation building, Chicago, will gladly furnish interested parties circular giving prices, etc.

# *Steel Castings for Heavy Service Made by Stroh Hardening Process*

The use of machinery of all kinds in the rock products industry, construction work and in utilities plants frequently involves the scrapping of parts and even whole machines because of excessive wear on only a very small, though essential, part of the metal. Such

**The Stroh Process Is a Method for Casting the Finest Alloy Steel Together with Ordinary Soft Steel**

is perhaps most often the case with such parts as pinions, gears, wheels, sprockets, sheaves, kiln and ball mill parts and jaw members and grinding plates in crushing machinery. The actual percentage of the weight of a steel casting which is worn away in practice is generally very small. For example, the teeth of the average gear constitute less than ten per cent of the total weight; a worn tooth weighs half as much as a new—and the remainder, or 95 per cent has been used merely for supporting weight or stress and is never worn out. The use of hard material is of no benefit in this greater portion and is nearly always detrimental, both on account of the expense of machinery and the nature of high carbon or high alloy steel.

The solution of this problem is claimed by the Stroh steel hardening process. It puts Stroh alloy, held to be the greatest wear resistant steel known, only on the parts subject to actual abrasion. The easily machined and cheaper material is used in the other 95%, thus cutting down expense.

After graduating from the University of **Michigan** as a chemist and metallurgist Mr. W. Y. Stroh, the inventor of the Stroh steel hardening process, became identified with the manufacturing end of several of the country's largest industries, during which time he foresaw the need and demand for greater service in the mechanical equipment, particularly in the parts where abrasion and wear were most severe.

The Stroh process is a method for casting the finest alloy steel together with ordinary soft steel in one solid piece. The resultant casting has a wear-proof alloy steel stratum upon the wearing surfaces, while the body is composed of any desired steel and is in no way affected. This alloy can neither come loose, nor spall, nor spread and flow. Its depth or thickness, its location and its hardness are completely controlled and are varied according to the size of the piece and nature of service expected.

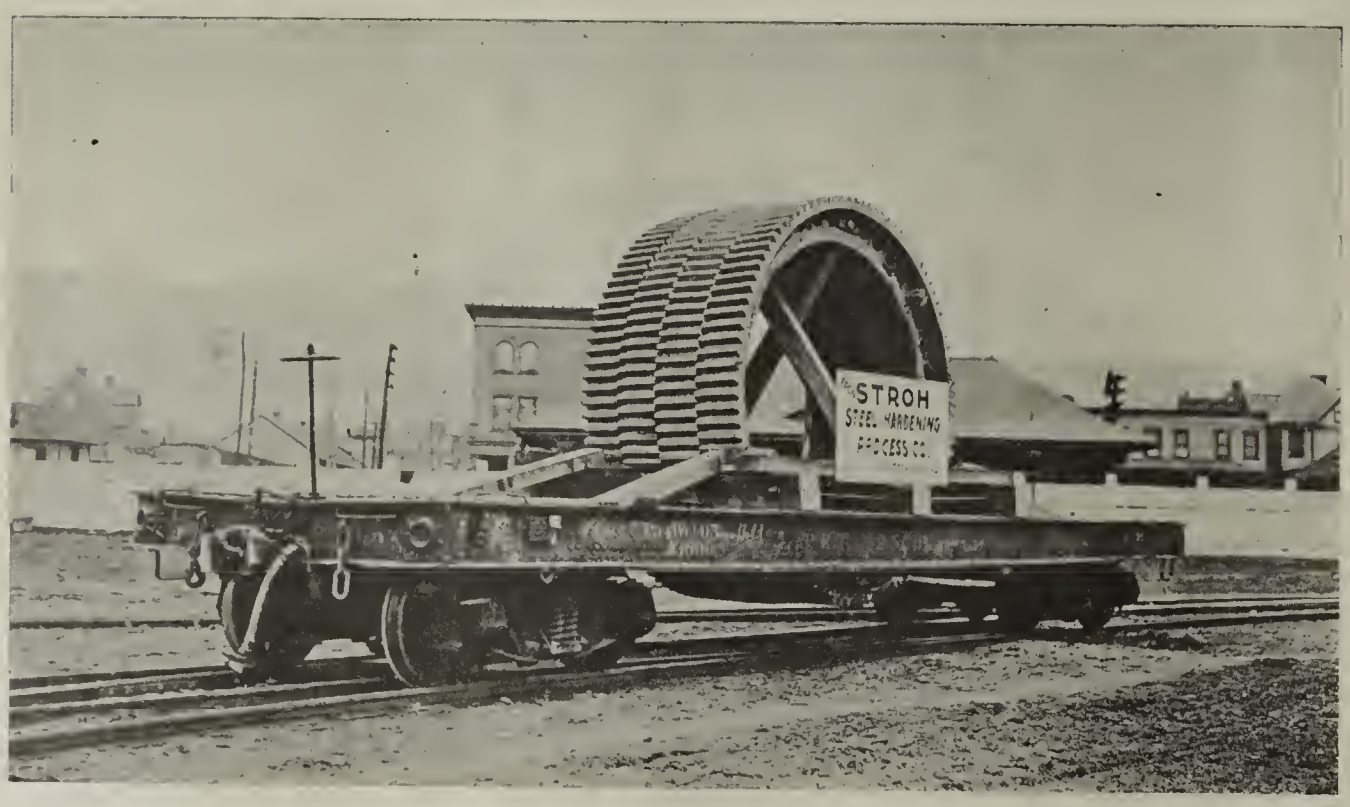
The manufacture of these castings naturally requires careful control and specially skilled labor. These are claimed to be the chief features of the Lawrence and Darlington foundries, where the Stroh process castings are made. The foundries turn out carbon steel, titanium, nickel or manganese steel castings. The typical casting generally has a base of ordinary carbon steel, the others being made on specifications.

These castings are widely used in crushing machinery, the Blake jaw crusher, in fact, having been first made at the Lawrence foundry.

One of the accompanying illustrations shows some gyratory crusher heads. Stroh castings are used for heads and plates and have been found very satisfactory. The Stroh steel concave plates do not peen over or flow and bend. Removal or resetting of worn Stroh steel plates is as easy as of iron. The other cut illustrates a shipment of gears for a cement manufacturing company.

Stroh process castings are the products of the foundries of the Stroh Steel Hardening Process Co., First National Bank building, Pittsburgh, Pa.

Since 1911 the company has furnished castings to a number of the most important industries. When the United States Steel Corporation built their new cement plant in Duluth, Minn., in 1916, they equipped this modern, up-to-date cement mill throughout with Stroh process gears and pinions. The Lawrence Portland Cement Company, Siegfried, Pa., placed a new Stroh steel pinion on one of their Smidth tube mills in the Raw Material department and after running 8,277 hours (during fourteen months), Mr. Porter, the superintendent, declares that the pinion is still in good condition, showing very little wear, and the pinion was not reversed.



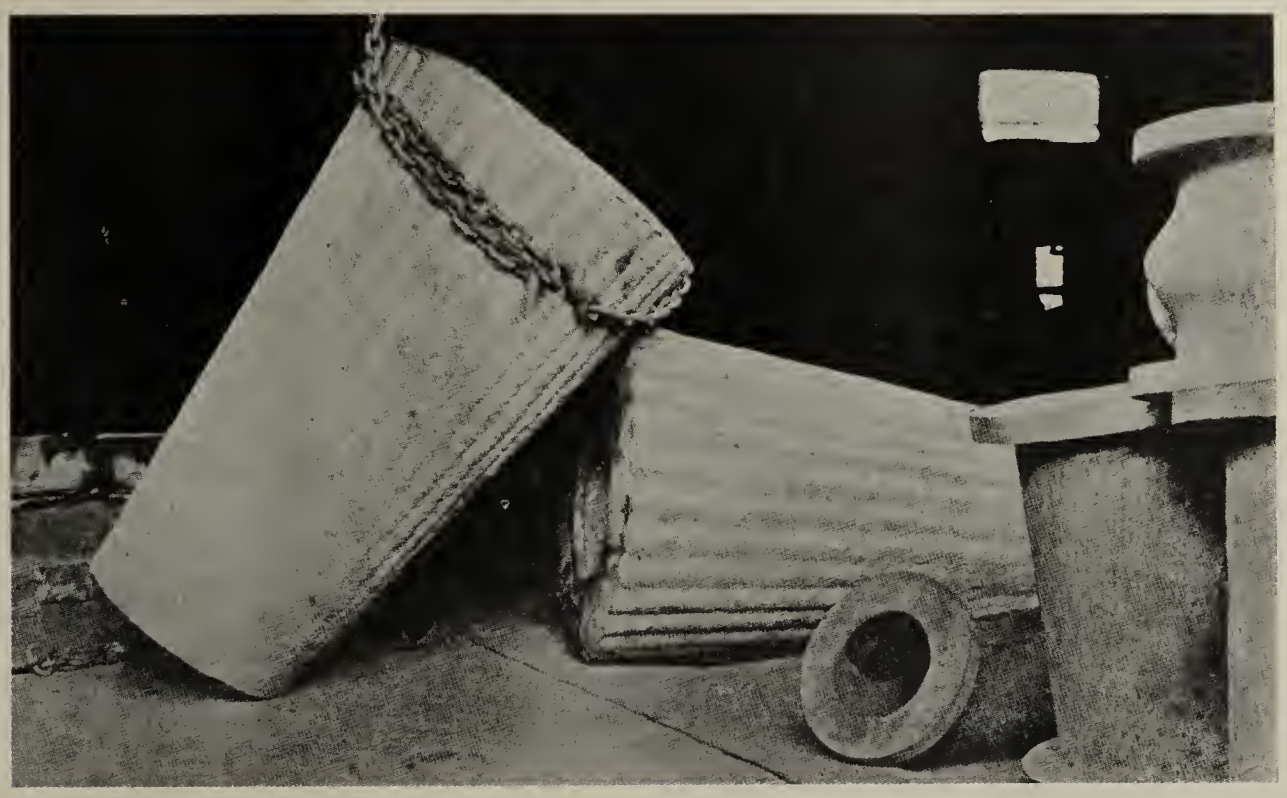

**A Shipment of Stroh Process Gears to a Cement Manufacturing Company.**

Stroh Steel is the result of the demand for increased efficiency and economical

service where wear, abrasion and shock are considered. The Stroh Company extends you the use and counsel of its experience on all questions pertaining to the use of Stroh Steel in your plant. Stroh process has been in constant and satisfactory service for a number of years in the mechanical equipment of some of America's largest industries.

## New Luten Type Arch Concrete Bridge in Arizona

A Luten type arch concrete bridge will be built over a deep gulch on the Arizona state highway near Tombstone, according to Division Engineer Cy Perkins. This type of bridge was suggested because of the possibility of making it artistic in design. The small additional cost of making highway bridges sightly is a good investment for the public.



Stroh Process Gyratory Crusher Heads.

## Two or More Electric Blasting Caps in a Bore Hole

The blasters who never have misfires are the blasters who place at least two electric blasting caps in each charge of explosives. A missed hole is not only a nuisance and embarrassment, but it wastes time and is a source of danger as long as it remains. Some time ago one of the leading technical papers invited discussion among its readers on the proper procedure in the case of misfires and it was noticeable that there were very few replies. This is not because misfires are so uncommon that miners and engineers have had no experience with them, but because most blasters are reluctant to admit, especially on paper, what they frequently do with holes which have missed fire. The directions of the explosive manufacturers, the Bureau of Mines and various authorities on the subject of blasting recommend or direct that the bore hole be left undisturbed and that a new hole be bored far enough away from the missed one to be perfectly safe, but near enough to it so that when charged and fired it will explode the charge in the old one. This looks easy enough on paper, but how about the bore hole that takes four or five days to drill, and the bore hole which has been sprung and contains several cases of explosives, the exact position of which is unknown? It is a regrettable fact that a large proportion of men using high explosives, when they encounter a charge which has misfired, forget their directions and take a chance on digging out the tamping, even though they know they are taking their lives in their hands in doing so. It may as well be candidly admitted that in some instances the man with the misfire is strictly "up against it."

Although the cure of a misfire is difficult, uncertain and dangerous, the prevention is easy enough, or at least it is not difficult to load the charge in such a way that should a misfire occur it will not be necessary either to drill a new hole or to dig out the tamping in the old one. One way, of course, is not to put any tamping in, in which case it is the easiest thing in the world to insert another primer and try again, but this method is exceedingly expensive, as it is impossible to get the work out of dynamite in holes which are not tamped; in fact it is necessary to very greatly overload them to get even a part of the work.

The other way, and the right way, is to place at least two primers in each bore hole. If the number of holes to be fired at one shot is very nearly as great as the number of electric blasting caps that the blasting machine will fire, only one of the primers from each hole is connected up, the other kept in reserve, so that in case of a charge missing fire, the second electric blasting cap can be connected up and fired. At first thought, this method may appear to be expensive and extravagant, but it is really much less so than it appears, because in the event that all the charges fire at first, it is a proven fact that the second detonator far from being wasted really pays more than its cost by increasing the completeness of the detonation of the dynamite, and the amount of work done. Where large charges are loaded in each hole, as in sprung holes, it is customary to place one primer in the pocket and the other in the bore hole and if the total number of electric blasting caps used are well within the capacity of the blasting machine, to connect them all up and fire them as if each were in a separate hole. This not only insures the explosion of each charge, but also insures the maximum possible efficiency of the explosive.

The fact that two detonators are able to get more work out of the dynamite than one was shown conclusively in the first blasts made in well drill holes.* The old idea that one detonator was able to explode an indefinite amount of dynamite was shown to be erroneous, as frequently the top of the charge where the detonator was would explode and do good work, while unexploded dynamite would be found in the bottom. When two electric blasting caps were used, one near the top and one near

the bottom, complete detonation of the entire charge was assured in moderate size holes and better work was done than with only one detonator, even when one left no unexploded dynamite. No well drill holes are fired nowadays with but one electric blasting cap per hole, and not many with only two, for not only the increased efficiency more than pays for the extra ones, but there is too much money value in explosives in a big well drill hole to risk any chance of a misfire. Three, four and even more electric blasting caps are now frequently used in each charge in well drill holes, and it is not improbable that the popularity that this method of blasting has enjoyed in recent years is due to the fact that not only the explosive is most thoroughly detonated, by having several electric blasting caps in it, but also from the freedom from misfires which goes with this method of loading.

*Holes usually 5⅝ inches in diameter and 40 to 110 feet deep, drilled by a well-drill.

## Ten Thousand More Silos for Indiana

The state of Indiana is going to fight the war in the corn field. It takes the lead in promoting a silo for every farm.

The campaign already under way is without doubt the most comprehensive of its kind ever organized in America. The State Council of Defense, the State Committee on Food Production and Conservation, the Extension Department of Purdue University, the county agricultural agents, the farm press and daily papers, the builders of various types of silos, hundreds of patriotic farmers, bankers and merchants are all directing united effort to accomplish in a single year what ordinarily would be considered the work of ten or more.

The campaign for ten thousand more silos for Indiana is being conducted under the general direction of Maurice Douglas, of Flat Rock. Mr. Douglas bears the title of state silo leader. All of Indiana's ninety-one county agricultural agents have perfected county and township silo organizations to tie their efforts to the broad state activities. The work in each county is directed by the county silo leader, and local silo leaders for each township. The state silo leader and his advisory board have specified each county's quota of new silos according to the volume of dairying and stock raising in each county. Reports will be made at frequent intervals showing the progress of the campaign in every community of the state, and every effort will be made to speed up silo slackers.

Indiana says: "If you cannot put a gun on your shoulder, put a silo on your farm." Indiana farmers are keenly alive to the situation and it is unquestioned that their silo building achievements this year will have a most important bearing on the economical production of live stock and dairy products in the state.

This campaign is one which should be organized and carried through to successful ending in every state in the Union.

## Interesting to Concrete Contractors

"Boss" high-speed, heavy-duty, light-weight, self-oiling, Hyatt roller-bearing type concrete mixers, which also mix permanent mortar; pavers, hoists, back fillers and pumps, built of steel and guaranteed by the American Cement Machine Company, Inc., of Keokuk, Iowa, are described in Catalog No. 18 of that company, a handsomely illustrated publication of large pages and complete contents relating to the various products to which it is devoted. The company also makes grouters, material elevators, concrete carts, etc. Tables of specifications and capacities make the catalog very full and satisfying to all who may be interested.

## Bulk Cement in Silo Stave Plant

There is interest in the products plant of C. J. and M. Davis, Timewell, Ill., whose principal output is Caldwell silo staves, manufactured from molds furnished by the Co-operative Concrete Construction Co., Oskaloosa, Iowa. because they use bulk cement and find that it pays, with no more special apparatus than wheelbarrows and one shop car with a flat open box on it for handling the bulk material. A letter from H. Bradney, manager of the plant, says in part:

"Bulk cement is the handiest and best thing we have. The bulk cement room and the sand pit are side by side, with the mixer about equidistant from each supply of material. Early in the morning we fill a flat car with a large box on it full of bulk cement and run it up to the mouth of the Winner batch mixer. It is much easier to shovel bulk cement into a mixer than it is to untie sacks and clean them afterwards, to say nothing about the bother of taking care of them afterwards.

"Sack cement costs us about 3 cents per barrel to unload. Bulk cement costs us about the same, or sometimes a cent more. We use about a carload a month besides what we sell. We keep sack cement for customers.

"We get bulk cement in 173-barrel cars. The car is run on our siding almost to our bulk room. An elevated platform with only a slight incline runs from a trap door in the roof of the bulk room to the door of the car. The distance from the door in the roof and the door in the car is about 20 feet. Two men stay in the car and two men wheel the cement to the room, using four wheelbarrows. A car of 173 barrels can easily be unloaded in 6 hours to 7 hours.

"Two men divide their time operating the mixer, making silo door frames and yarding the staves. They also keep two stave makers supplied with concrete, using wheelbarrows to carry the mix about 5 feet. The men making staves do nothing else except run their cars into the curing rooms. We also have fence post machines, Ideal block machines, and a Dunn tile machine. But extra help is used to operate them. Silos are our principal product. The four men make a silo every two days, complete. The stave makers can average a hundred staves each per day. By adding two more men we can increase our capacity to a silo a day. The staves are tamped and handled on pallets.

"We use steam curing only on tile and building block, because in curing staves with steam the whole surface of the stave must be exposed and the steam condenses and makes holes in the staves, by dripping, from the rafters. (An archer ceiling would prevent dripping—Editors.) The staves, after being left on one side to cure for two days, are sprinkled by means of a hose in the yard for several days afterward.

"We build and erect silos in four counties. Transportation breakage is so slight that it need not be considered at all. Freight rates are low and do not keep us from competing to good advantage with any silo firm. An average stave silo can be hauled out in 10 loads and erected in two days to three days.

"Our machine has a capacity of 4,000 tile per day, making sizes from 5-inch to 16-inch. We are also equipped with hand molds for making larger sizes.

"A 12 horsepower gasoline engine runs the entire works. In addition to running the tile machine and Kent mixer, it is connected to a shaft which operates a pumping jack which forces water into a large pressure tank. This gives us water any place on the grounds. The shaft also operates a steel drill."

# Design and Construction Features of a Sand and Gravel Storage Plant

Several unusual features are embraced in the sand and gravel storage plant which has recently been put into operation by the Ohio River Sand Co. at Louisville, Ky. The plant, distant several miles from the company's yards, is designed for storage of materials for wagon hauling in that part of the city and for delivery to the street railway company, which has built a switch into the storage plant.

The plant is located on a spur of a belt line which passes around the city, so that deliveries to it may be made directly from the company's switch at its own yards, where railroad cars may be loaded, by steam railroad.

This plant consists of two cylindrical reinforced concrete bins, each supported on eight reinforced concrete columns, a reinforced concrete hopper into which the materials are dumped from railway cars, equipment for elevating the sand and gravel into the bins and spouting systems for discharging the contents into wagons or cars.

The capacity of each bin is 325 cu. yds. of sand or gravel and each of these bins is 20′ 6″ inside diam. and 25′ high. The walls have a uniform thickness of 8″ and the bottoms are sloped to facilitate discharging the contents of the tanks through the spouts, three of these being supplied for each bin, two to load wagons and one each to load cars. The bins rest on reinforced concrete columns; the distance from bottom of bins to top of column footings is 29′.

Across the top of each bin there is a reinforced concrete slab which covers the central portion of the bin, the slab being 5′ 6″ wide and 3″ thick. It spans the distance from wall to wall and is carried by 9-in. x15-in. reinforced concrete beams, at the outer edges of the slab. Above the two bins, resting upon a portion of the top of the wall of each, is a concrete block motor house, enclosing a 30-h. p. motor, and other machinery required to operate the conveyor system. This house is about 10′ x 12′ and 8′ high. At the bases of the bins is the office and weigh room, constructed of concrete block.

In designing the cylindrical bins, the sand or gravel, was assumed to weigh 117 lbs. per cu. ft. The angle of surcharge and the angle of repose were taken as 28° minimum and 40° maximum, the angle of friction of gravel on concrete was assumed to be 31°. The computations as to lateral pressure on the circular walls were made according to the formula, 53.22 $h^2$ where "h" is the height in ft. The allowable compressive stress in the concrete was taken at 650 lbs. per sq. in. and the allowable tensile strength in the reinforcing steel at 16,000 lbs. per sq. in. The allowable bearing power of each concrete pile was 15 tons.

### Construction Methods

Some of the Simplex concrete piles[2] on which the concrete footings rest were driven 39′ below grade, footings and columns both being heavily reinforced.

It will be noted that the hopper is spanned by a railroad track through which the sand and gravel are dumped and thence conveyed to the bins.

The construction company's plant on the ground included a 10-ft. Boss mixer, with a wood tower by which the concrete was raised and chuted directly into the forms. This mixer had a maximum capacity of about 65 yds. per da.

Glimpse of Two of the Ohio River Sand Company's Storage Bins. In the Foreground May Be Seen the Company's Fleet of "Acme" Motor Trucks, Which Help to Maintain the Firm's Reputation for Speed and Efficient Service.

Wood forms were used throughout in constructing bins and the column supports. The columns offered no unusual problems, two-in. tongue and groove flooring being used. In making the forms for the bins considerable ingenuity was displayed.

The forms were cut at the contractors' mill, a total of two carloads of lumber being used. The flooring for the wall forms were braced with bands formed of 2-in. lumber cut to correspond to the curve of the bins. These pieces were sawed at the mill from 2-in. x 6-in. stock, the concave pieces being used for the outside bands, or hoops, and the convex pieces forming the ribs for the interior forms. With the uniform curves these segments could be overlapped as much or as little as proved desirable, and were nailed together at the ends, the walls of the forms being tacked to them from the inside. This made it possible for sections of the forms to be put together on the ground and assembled on the floors of the bins. The outer walls were further strengthened by steel hoops while bracing timbers were used on the inside. The required wall thickness was maintained by wood spacers from inner wall to outer, these being poured.

Bins were poured in two sections; 14-ft. lagging was used for forms. Clean, sharp washed river sand and washed river gravel were used, with Portland cement,

the mix throughout being 1:2:4. Standard handling and quality specifications were adhered to throughout, the gravel being ¾″ or under. In pouring the concrete the engineer's directions provided that the concrete work between the spring of the girder haunches and 4′ above this point or about 1′ above the bottom of the tank wall, was to be poured in one operation.

Altogether about 1,000 cu. yds. of concrete were required for construction of the two bins.

### Mechanical Equipment

The elevator equipment[4] raises the sand or gravel from the hopper into which it is dumped from the railroad cars. From this hopper a chain elevator, carrying manganese steel buckets, extends to the motor house on the top. The elevator is enclosed in a 4-ft x 5-ft. boot, composed of ½-in. cast iron plates and made in sections of 13′ each, the whole rising to a point about 82′ above the hopper. At approximately this elevation the bucket elevator dumps into a small hopper from which the material is spouted into either bin, one being used exclusively for sand and the other for gravel.

### Cost

About four months were required to build the plant, which was constructed by the National Concrete Construction Co. on a cost and percentage basis. With machinery equipment, estimating the sand and gravel at market prices, cost is said to be between $30,000 and $33,000.

As the aggregate was supplied by the owners it was decided to handle the work on a cost and percentage basis instead of by contract. All vouchers, bills, checks, payrolls, etc., were made out by the builders in duplicate and at the end of the month presented to the sand company, which gave its check for the total. When the work was three-fourths done a proportionate amount of the estimated commission coming to the builder was paid him and the remainder, figured on the total costs of the work, at the end. For this reason, as well as owing to the difficulty of going through all the records of the operation, as would be necessary, it is not possible to quote detailed costs of the various steps, which have not been computed. It may suffice to say that the costs were held down to a point satisfactory to the owners of the plant.

The plant, which has worked satisfactorily from the outset, has proved an excellent investment. With the low handling cost and reduction of the hauling cost and haul itself accomplished, the company has been in position to handle many orders which otherwise might have been out of reach. The plant is close to a section which is rapidly building with homes and factories and much of the building material passes through this plant, while the Louisville Railway Company has been equipped to haul sand and gravel from this plant not only to its own work in the city but to the builders located on the interurban lines of the company.

## Concrete Fence Posts

Concrete fence posts must take the place of steel fence posts that farmers were learning to utilize so extensively up to the time that they became virtually unobtainable because of the price of steel. Concrete posts have many advantages over steel posts. The little strips of grass that grow under every fence and which the mower and binder do not get, burn over nearly every fall and cause steel posts to corrode and rust. Concrete posts are unaffected by the fires, users of concrete posts say.

An immense number of concrete fence posts must be utilized in the next year in conjunction with the campaign for more swine. Thousands of miles of hog-tight fence must be constructed if this campaign is to be a success and this means that more posts must be utilized than were the farms being fenced for cattle or horses. Many horse and cattle ranges will be converted into hog pastures by the construction of fences that will restrain these animals in the confines desired by the farmer. The same applies to the sheep propaganda that is sweeping over the country. These sheep flocks must be protected from the ravages of dogs and coyotes and wolves through the construction of fences that will turn back these ravagers. This makes an added demand for concrete fence posts. Inability to

**Four to One Hundred Posts Made at One Time. Dunn Fence Post Molds Are Made in Batteries of Four and Ten.**

procure such posts would be a calamity to the flockmasters who are planning to give the Federal Government the wool needed for soldiers' apparel.

Dunn fence post molds, manufactured by W. E. Dunn Manufacturing Company, 414 Twenty-fourth street, Holland, Mich., are made in batteries of four and ten, any number of which can be placed on the special vibratory base. In this way from four to one hundred posts can be poured, reinforced and compacted in a few minutes, without difficulty and at the minimum cost of manufacture. Write the Dunn Company for their post mold catalog.

## Plan to Avoid Forgotten Items in Estimating

One of the commonest causes of dispute between the retail lumber man and the customer that has just built a house is that the bill amounts to more than the estimated cost.

Very frequently this added cost is the result of some item being forgotten in the initial figuring of the house bill that had it been incorporated in the beginning, would not have caused the slightest trouble. In almost all cases of this kind customers seem to think that the retailer is trying to "put something over" and raise so much objection that many a lumberman has suffered a considerable loss rather than run the risk of losing a good customer.

It is the duty of the architect to prepare a list of materials, but only too frequently there is no architect in the smaller towns and the local lumberman has to serve in his stead and do the estimating. With the progress of retailing lumber this is becoming increasingly necessary in the largest and smallest towns alike.

An estimate book that lists in detail all of the items that ordinarily go into the construction of a wooden house will be found to be of great help to retail lumbermen as a sort of a "mechanical memory," and may save time, money and friends if applied conscientiously.

It is a good plan to provide several types of books for buildings of different kinds; say one for houses of the two-story type, one for barns and one for buildings of small size. The initial cost will be small as compared to the saving to the lumberman, as their use will enable the estimate to be made with greater speed and allow him to rest assured that nothing has been forgotten in the estimate.

The following gives an idea of the form that is desir-

able for a two-story house, the list to be tabulated, giving number of pieces, their size and lengths:

Framing—Sills; cellar posts; first floor joists, first floor bottom plates; first floor outside wall studs; first floor partition studs; first floor top plates; first floor porch joists; first floor porch plates; first floor porch studs; first floor porch top studs; second floor joists; second floor bottom plates; second floor studs; second floor partition studs; second floor top plates; ceiling joists; ceiling rafters; second floor porch joists; second floor bottom porch plates; second floor studs; second floor top plates; ceiling joists; ceiling rafters; joist bracing for all floors; bracing for roof rafters.

Outside Sheeting—Sheeting; building paper; siding; roof sheeting; building paper (where used); shingles; sheeting under eaves (D & M or ceiling).

Floors—First floor subfloor; building paper; flooring; porch subfloor; flooring; second story subfloor; building paper; flooring, second story porch subfloor; second story porch floor.

Stairs—Porch stair horses; risers; stepping; molding; stair horses to second floor; risers; stepping; molding; railing; pickets.

Lath and Plaster—Lath; plaster (hair or wood fiber).

Interior Finish—Base molding; picture molding; floor molding; plate rail; mantel; shelving for closets; material for any special built-in features such as bookcases.

Exterior Finish—Water table; corner boards (or metal siding corners); ceiling for roof of porch first and second stories; molding to border ceiling; porch columns; cornice work; roof saddle boards (or metal ridge roll); material for outside beaming or brackets.

Mill Work—Inside doors; outside doors; transoms; outside door frames; inside door frames; door frame trim; thresholds; windows; window frames; transom frames; outside window trim; inside window trip; special items.

Hardware—Framing nails; sheeting nails; shingle nails; flooring nails; finishing nails; lathing nails; casing nails; door locks; window catches; pulleys; sash cord; sash weights; paint; hinges.—American Lumberman.

## Return Empty Cement Sacks Now!

"In these days of strenuous endeavor on the part of all of us to continue our business activities in the face of unusual conditions," writes W. S. Mallory, president of the Edison Portland Cement Co., New York, in a recent communication to building supply dealers, "co-operation is more essential than ever before.

"We are certain you will be quick to appreciate the necessity for all of us maintaining our business activities, and I, therefore, do not hesitate to ask your help in the solution of a very serious problem which confronts us at this time—not only will you be helping us, but you will be conferring a favor on yourself and your government as well.

"Owing to the unprecedented congestion, many of our customers have been unable to return the usual number of empty sacks. Not only does this tie up many thousands of dollars, which purchasers might be well diverting to other essential purposes, but it has a tendency to create a dangerous shortage of empty sacks at our mill. We have on hand now less than one-third of our normal quantity of sacks. In the hands of our customers there are over two million sacks which should be returned, and which, if in our hands, would be ample for coming requirements. Market demand in our business during 1918, according to the best opinions, will be somewhat less than normal, but we must be prepared to supply your demand, and you in turn, the demand of your customers.

"The natural inference on the part of our customers would be that we should replace our supply of sacks with new ones. This we have been doing to the extent of our ability, but it is next to an impossibility to secure new sacks from the manufacturers on account of the shortage of cloth, and a not less important factor is the excessive high price of 21½ cents each. As affecting prices in general, you will be quick to appreciate that for our customers' interests we should keep our purchases of new sacks down to a minimum.

"You will see that in order to properly meet the situation we must depend upon your co-operation, which we know will be willingly given.

"First we ask that you secure from your customers all their empty Edison sacks.

"Second, that you prepare for shipment to us at New Village, N. J., all empty Edison sacks which you have and which you will receive from your customers, and that you do not wait until you have an exceedingly large quantity, for, in this crisis, every hundred counts.

"Third, that you will deliver the sacks to the railroad as soon as they have been prepared for shipment.

"Fourth, that you fill out and return to us at once, the card enclosed, which will fully apprize us of the sack situation as it pertains to you. Return of this card will also suggest to us wherein we may be able to help you in getting sacks back to us.

"I know that you will fully appreciate the gravity of the sack situation and that it is to our mutual interest to return all bags to us immediately.

"I thank you heartily for your co-operatiion which I know will be given, as it has been my experience that when we make necessary requests of our friends, each of them is always ready to do his part."

A postal card addressed to Mr. Mallory was enclosed in the letter. On this card was stated the number of sacks due to be returned by the dealer, according to the cement company's records. The question was asked as to whether the dealer's records agreed with this count. In addition to this, the following questions were asked: How many sacks have you ready for delivery to the railroad? What railroad do you use to return sacks to us? Has the railroad refused to accept any sacks from you and when? How many sacks can you send us in the next few days? What difficulty are you having to get your customers to return empty sacks?

## Sheet Steel Doors for Curing Rooms Replace Wood

When the plant of the O. C. Barber Concrete Company, Barberton, Ohio, was first used in the fall of 1914, the doors of the curing rooms were of matched lumber. Efforts were made to prevent their taking up moisture and swelling unduly, by using heavy coatings of paint. Manager P. E. McAllister says that this was not successful and that it finally became necessary to take these doors off entirely and to build up doors of sheet steel of a light weight on frames of T iron and angle iron which are now in use and are giving satisfaction. The doors work up and down, balanced by counter weights of concrete.

## Road Builder's Catalog

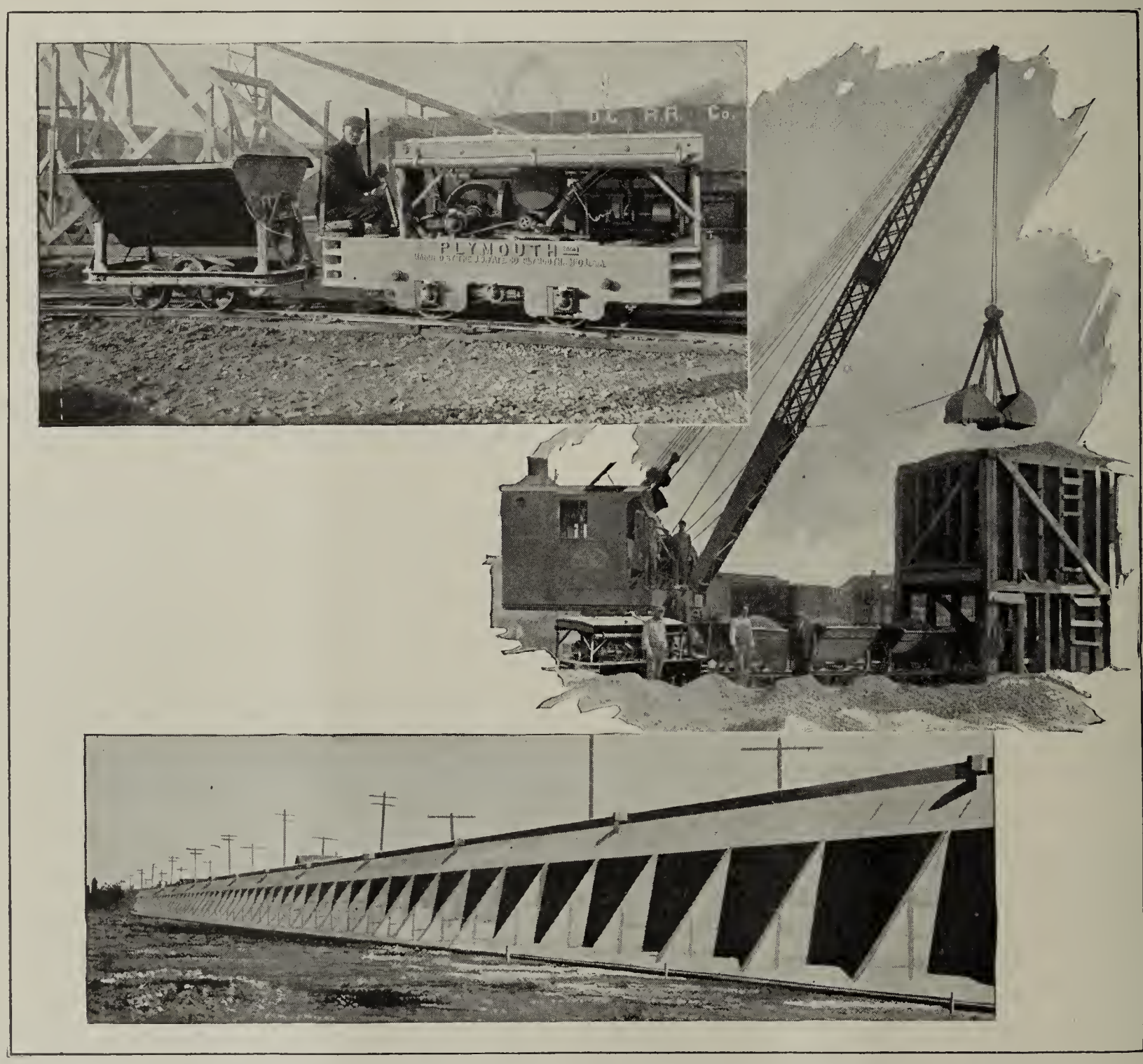
Road builders will be interested in "Austin-Western Catalog No. 18," which has just been issued by the Austin-Western Road Machinery Company of Chicago. The catalog is indexed, attractively printed and illustrated, and is full to the brim of useful information.

# *Construction Plants and Methods Employed in Building the Reinforced Concrete Reservoir at Highland Park, Mich.*

Highland Park, Mich., adjoining Detroit, and the seat of the Ford Motor Company's great industrial plant, has a population of about 20,000. The city plans to grow, and in planning public improvements to meet future needs they are made large enough to take care of future growth. The handling of the enlarged water storage facilities is a case in point. The new reinforced concrete reservoir has a capacity of 45,000,000 gallons, and it is estimated that this will provide ample storage for years to come. The superseded reservoir now serves a coagulation basin. At the present rate of consumption the new reservoir will hold a four days' supply.

Highland Park reservoir enjoys the distinction of being one of the largest projects of its kind in the United States. Great credit belongs to Messrs. Lawrence Whitset, city engineer; Harry Hulbert, superintendent of public works; E. J. Lieber, engineer in charge of construction, and George L. Wright, concrete and steel foreman, for the thorough-going way in which the work was planned and carried out.

It was put through by the city on direct contract, and so thoroughly were all the details planned and so co-ordinated that approximately $15,000 was saved on a single section of the work.




CONSTRUCTION VIEWS OF WATER WORKS RESERVOIR AT HIGHLAND PARK, MICH
Gasoline Locomotive Hauling Industrial Car—Locomotive Crane and Clamshell Bucket Unloading from Gondola Cars to Elevated Bins over Industrial Railway Track—Section of Finished Wall.

### Design Features

The new reservoir measures 1,373 feet long by 294 feet wide by 14 feet deep. It is supplied from an intake crib and pumping station on Lake St. Clair, eleven miles away, from which the water flows to the reservoir by gravity. Another set of pumps at the reservoir delivers the filtered water over Highland Park.

It is pleasing to note that the plans upon which this system was laid out, and the methods employed in building it, were in keeping with its importance—the

The design of the reservoir itself, the construction features entering into it, and the facilities employed to keep things moving efficiently, are all in harmony with the importance of the work from the standpoint of immediate and future needs.

### Construction Plant Employed

On every hand as one views this concrete structure is evidence of the builders' dependence upon machinery to do all the important work—accurately, thoroughly, and in a big volume.

The excavating was done with three steam shovels—

and that gives a key to the plan on which the whole job was put through. Inside the reservoir was a complete system of industrial railway, which kept the "front lines" supplied as the work advanced.

Two Plymouth gasoline locomotives, manufactured by the J. D. Fate Co., 220 Riggs avenue, Plymouth, Ohio, of the type shown in the illustration, furnished the tractive power, and the equipment also included twenty-two industrial cars. In the storage yard were the main track and a number of spurs.

The material was unloaded from the gondolas by a locomotive crane and clamshell bucket, and stored in elevated bins—from which it was unloaded into the industrial cars by gravity and delivered to the mixers right on the reservoir floors.

A notable point about the pouring was the fact that the mixers were so spouted as to cover a 50-foot strip of floor at each pass—25 feet at either side. Very little hoeing was required to get the concrete in place and an average of 10,000 square feet a day was easily maintained.

Liberal credit is given by the builders to the efficient transportation system, which permitted unloading the materials from the railroad at one point and rehandling it economically as the work advanced.

Some of it, of course, had to be carried the maximum distance, and one section of the reservoir wall was left open until the very last to permit the trains to pass through; but the locomotives did their part well, the work progressed rapidly and economically right through to its conclusion, and modern industrial haulage has another success to its credit.

# *Durability of Cement Draintile and Concrete in Alkali Soils*

A report covering the co-operative investigation under the auspices of the U. S. Bureau of Standards into the distintegration of concrete when exposed to strongly alkalined soils and waters in the arid regions of the western part of the United States has been issued recently by the Department of Commerce as Technologic Paper No. 95. This report contains the results of the third year's tests.

The investigation was started by the exposure of various cement mixtures in the form of drain tile. In 1915 the study was expanded by the installation of blocks of concrete of known composition.

The tile were made under contract at a commercial tile plant and under the supervision of a representative of the Bureau of Standards. Work was commenced in July and completed in September, 1913, and shipments were made in October, which allowed a curing period of one month for the last tile made. Although it was anticipated that some of the tile of the leaner mixtures which are satisfactory in the humid regions would fail in these alkali soils, the program was arranged to include tile made from the leanest to the richest commercial mixtures.

The tile were installed in operating drains on eight irrigation projects of the U. S. Reclamation Service in what were thought to be the most concentrated alkali soils available in the West and in districts where there was practically no alkali for comparison. The locations of these drains are as follows:

Alkali districts: Garland, Wyo.; Fort Shaw, Mont.; Huntington, Utah; Sunnyside, Wash.; Yuma, Ariz.; Roswell, N. Mex.; Grand Junction, Colo.; Montrose, Colo.

Fresh-water districts: Crookston, Minn.; Columbia, Mo.

One set of tile of each type also was stored in the open exposed to the atmosphere at Ames, Ia., for reference and test.

The program requires the removal of at least two tile of each type at each project every year for test and inspection. Sufficient tile were made to continue the investigation 10 years or longer if necessary.

In the concrete investigation in order that actual field conditions might be duplicated, blocks of concrete 10 in. square and 2½ ft. long and were molded, under the supervision of a representative of the Bureau of Standards, and installed on projects of the U. S. Reclamation Service in soils where concrete structures have apparently been affected by alkali. The blocks were placed vertically with about 1 ft. embedded in the ground and a portion exposed to the atmosphere. One series of blocks ("A Specimens") was molded at Denver, a central point, where an excellent quality of aggregate was available, in order to secure a uniform and good quality of concrete. These blocks were shipped to the various projects. Another set of blocks ("B Specimens") were molded at each project and after curing was set in place, while a third set ("C Specimens") was molded in place immediately exposed to alklai water.

At each project the cement in use there was used, and the aggregates were of those at present available in commercial quantities near the site of construction on the projects. Two mixtures were used: 1 part Portland cement to 1½ parts fine aggregate to 3 parts coarse aggregate; and 1 part Portland cement to 2½ parts fine aggregate to 5 parts coarse aggregate. The concrete blocks were installed in 1915. A summary of the results of the tests as given in the report follows:

### Summary of Results of Tests

Concrete.—After one year's exposure none of the 1:1.5:3-proportion blocks molded at Denver with selected aggregates (series "A") have shown signs of disintegration on any of the projects. The 1:2.5:5-proportion blocks have also been unaffected, with the exception of those installed on the Sun River and Grand Valley projects.

It is noticeable that the "C" series blocks, molded in place exposed to alkali waters, are in better condition than the "B" series blocks, made of the same materials but placed in the soil after 28 days of curing, on the Belle Fourche, S. Dak.; Sun River, Mont.; Rio Grande, N. Mex.-Tex.; Uncomphagre Valley, Colo.; and Grand Valley, Colo., projects. On the Shoshone, Wyo., projects the "C" series blocks were very slightly affected, while the "B" series blocks were in perfect condition.

Blocks made of sand-cement concrete molded at Denver were installed on the Grand Valley, Colo., project. The two 1:1.5:3-proportion blocks were scaled and pitted for a distance of 6 in. above the ground surface, while one block of the proportion 1:2.5:5 was disintegrated to a depth of 1 in. The second 1:2.5:5-proportion sand-cement block, made of such a dry consistency that rough surfaces and corners resulted in molding, was unaffected by the alkali.

Natural-cement blocks, of the proportion of 1:1.5:3, were molded on the Grand Valley project in a manner similar to the "B" series blocks. These blocks were entirely disintegrated three months after being installed.

Draintile.—The disintegrating effect of alkali on the experimental tile varied directly with the concentration of salts in the waters. Attention is called to the fact that all of these waters contained over 21 per cent (12.5 per cent reacting value) of sulfates. The disintegrating effect seems to be directly proportional to the total quantity of sulfate and magnesium.

The tile exposed to waters containing the larger percentages of carbonates have shown less indication of disintegration. However, these waters having the higher

content of carbonates also have the lower concentration of salts, so that it can not be stated definitely that the presence of the carbonates are a factor.

The results of the crushing tests of tile made at Ames in 1916, together with the results of the absorption tests, are especially worthy of notice, since they show that the effect of absorbed water in the walls is to materially weaken cement tile. This reduction in strength of from 10 to 30 per cent probably accounts for many of the varying results obtained in the field, since the walls of the tile as removed from the drains contained varying amounts of water when tested. Even though all of the tile of any one series were of the same density and homogeneity, the condition of exposure alone would account for many large strength variations.

Since the resistance of the tile to alkali action is found to vary more generally with the consistency of the mixture and the method of manufacture, the following grouping is made for convenience of reference:

(a) Plastic mix—machine made. Series 8, 12, and 16 (proportions 1:4); 7 and 11 (1:3); 9 and 10 (1:1.5); 19 and 20 (1:2.5 replacement tile).

(b) Plastic mix—hand made. Series 1 (1:2.5); 3, 4, 5, and 6 (1.2).

(c) Quaking mix—hand made. Series 2 (1:2.5); 17 (2:1.5); and 18 (1:2).

(d) Fluid mix—hand made. Series 14 (1:3) and 15 (sand cement 1:3).

Considering group (a), one or more of the tile of each series have been found to contain varying quantities of salts at one or more of the projects. Tile of the proportion 1 part cement to 4 parts sand, plastic consistency (series 8, 12, and 16), have been found in this condition in all experimental drains where exposed to alkali waters, and at five of the eight projects swelling, cracking, and partial disintegration has occurred. Tile made of 1 part cement to 3 parts sand (series 7 and 11), plastic consistency, with a few exceptions have given no indications in the crushing tests that they have been seriously affected, although alkali salts have been found in the walls of many of the tile, and in one case swelling and cracking were observed.

Tile of group (b) have been found generally to contain salts at all projects where exposed to alkali water. In some cases swelling and cracking were observed. None of these tile are made of mixtures leaner than 1 part Portland cement to 2½ parts sand. The inefficiency of hand tamping of a plastic or dry mixture is clearly shown by these tile. The resistance of these tile to alkali exposure is apparently no greater than that of the leanest mixture of group (a). No beneficial effects have resulted from the addition and the use of ferrous sulfate in the mixing water of series 6 or by a coating of neat cement grout (series 4) or coating of tar (series 5). All tile of these three series were made in the proportion of 1 part cement to 2 parts sand.

Of group (c) the tile series 2, quaking consistency, were hand tamped, and those of series 17 (1 part cement to 1.5 parts sand) and 18 (1 part cement to 2 parts sand) were made on a jigging device. No salts have been found in any of these tile when tested, but one tile of series 17 at Roswell and one tile each of series 17 and 18 at Montrose were attacked and disintegrated on the surface. With few exceptions these tile when tested have appeared dry, or wet in spots only, in the interior of the walls. The tile of series 2 (1 part cement to 2.5 parts sand, quaking consistency) are the only tile which have to date shown no disintegration nor alkali salts in the pores at any of the projects where exposed to alkali water.

In group (d) are included series 14 (1 part Portland cement to 3 parts sand, fluid consistency) and series 15 (1 part sand cement to 3 parts sand, fluid consistency). The sand-cement tile have shown alkali in the pores, and in numerous cases have shown a softening of the surface at several of the projects, which action was first noticed at Montrose in 1914, when the first year's tests were made. Series 14, most nearly comparable with series 2, group (c), has usually been found dry, or damp only in spots, when tested. A small amount of alkali was visible in the end of one tile each of series 14 at Montrose and Grand Junction in 1916.

Nothing has been found in the results of tests or the appearance of the tile at Crookston, exposed to fresh water, which would indicate any harmful constituent in the soil or water. The variation in the average results for each series during the past three years is less than the variation obtained at Ames in 1916 for the dry and saturated tile.

## Conclusions

Concrete.—No definite conclusions can yet be drawn as to the ultimate resistance of concrete to the action of alkali in the soils and waters on the projects. However, the complete failures found at the Belle Fourche project, where local materials were used, together with the action which has commenced on the surfaces of the blocks on other projects, indicate that materials of good quality and proper workmanship are of greatest importance.

The surface action noted on blocks at several of the projects was not confined to those made of local materials, but was also apparent on some of the blocks made of selected aggregates ("A" series molded at Denver). Whether or not this surface action on the best-quality concrete blocks is progressive will be apparent after a longer period of exposure. Concrete which is to be placed in alkali soils should be made of selected and tested materials, so proportioned as to produce a dense concrete. As small an amount of mixing water should be used as will allow the mass to be properly placed. Unless these precautions are taken the resistance of the concrete to alkali action will be reduced.

Draintile.—The following conclusions may be drawn for the use of cement drain tile exposed to soils or waters containing alkali salts in quantities of 0.1 per cent or more:

1. The use of cement tile in soils containing alkali salts in large quantities is experimental.
2. Porous tile due to the use of lean mixtures or relatively dry consistencies are subject to disintegration.
3. Some dense tile are under certain conditions subject to surface disintegration.
4. Disintegration is manifested by physical disruption caused by the expansion resulting from the crystallization of salts in the pores and by softening, resulting from chemical action of the solutions with the constituents of the cement.
5. While results obtained will not permit of a definite statement as to the relative effect of the various constituents of the salts, indications are that the greater the quantity of sulfate and magnesium present and the greater the total concentration of salts the greater will be the disintegrating effect.
6. Tile made by the process commonly used, which allows the removal of forms immediately after casting, are subject to disintegration where exposed to soils or waters containing one-tenth per cent or more alkali salts similar in composition to those encountered in this investigation.
7. The hand-tamped tile of plastic consistency as made in this investigation are not equal in quality to machine-made tile of the same mixture, and they do not resist alkali action as well.
8. Steam-cured tile show no greater resistance to alkali action than tile which are cured by systematic sprinkling with water.
9. Tile made of sand cement have less resistance to

alkali action than the tile made of Portland cement of the same proportions.

10. The tar coating as used is not effective in preventing the absorption of alkali salts from the soil.

12. No advantage is found in introducing ferrous sulfate into the cement mixture.

If cement draintile are to be used in alkali soils or waters containing 0.1 per cent or more of salts similar in composition to those encountered in this investigation, they should be made of good quality aggregate in proportions of not less than 1 part Portland cement to 3 parts aggregate. The consistency should preferably be quaking, which has proved the most resistent of all mixtures used. This is wetter than that generally used in commercial tile plants and will probably require the retention of the tile in the molds for several hours, unless some means are found to hasten the hardening of the cement.

## Jaeger Concrete Mixer's Origin and Growth

The widely-known high quality of the Jaeger concrete mixers, which are used in thousands by contractors everywhere, makes especially interesting a graphic sketch of the growth of the business of the Jaeger Machine Co., which it has published. The company was organized in 1906 to make a concrete mixer invented by G. Jaeger, the Jaeger Positive Mixers being first made in a shop bought at Bell and Broad streets, Columbus, Ohio. Next a concrete block machine was made. Growing business compelled larger quarters so a factory building of concrete construction was erected on land between the Rich street bridge and Starling street, on the river front. In 1912 a new type of concrete mixer was manufactured. The next year a big flood caused great loss and damage in the city, but this factory, being above water, was closed down and turned over to the flood relief committee, which used it for three weeks, when business was resumed. River improvements compelled the plant to move again last spring, this time to the former factory of the Midgley Manufacturing Co. on West Dublin avenue, where there is plenty of room for the growing business, there being about three and one-half acres of land under roof, all on the ground floor, making the place one of the very largest exclusive mixer manufacturing plants. The address of the company which makes these machines in four sizes and fourteen styles, is 212 West Rich street, Columbus, O.

## Sidewalk, Curb and Gutter Steel Forms

Modern tendency in construction work is strongly toward the use of efficient and economical machinery and equipment. Nowhere, perhaps, has this been more evident than in concrete road work. The machinery and methods have been given the closest attention and the equipment has come in for its full share of development.

It is to the equipment, particularly to the form work, that the Automatic Sealing Vault Company has devoted a great deal of attention. The company has developed the Indiana Steel Forms for sidewalk, curb and gutter forms. The advantages of these forms over the old type of wooden forms are many. The use of steel forms absolutely eliminates all sawing, measuring, fitting and cutting. The labor cost of setting forms is greatly reduced as these forms can be set up and removed in a small fraction of the time required by wooden forms. The steel rails are rigid and will not deflect, nor will they absorb moisture from the concrete, or allow the rich grout to leak out into the ditch. The steel forms are practically indestructible; there is no continual replacing as with wooden forms and you can do nicer and better work.

Present material and labor costs cannot be lessened and profits can only be increased by using labor-saving equipment like Indiana improved all steel forms, which are the simplest and easiest to handle and they speed up and do better work at lower cost. Indiana forms are exceptionally light, but of maximum strength and are used by hundreds of contractors throughout the country. Write the Automatic Sealing Vault Company, 216 E. River street, Peru, Ind., for descriptive booklet.


# Indiana Steel Forms for Sidewalk Curb and Gutter and Curb Only

STEEL FORMS COSTLESS

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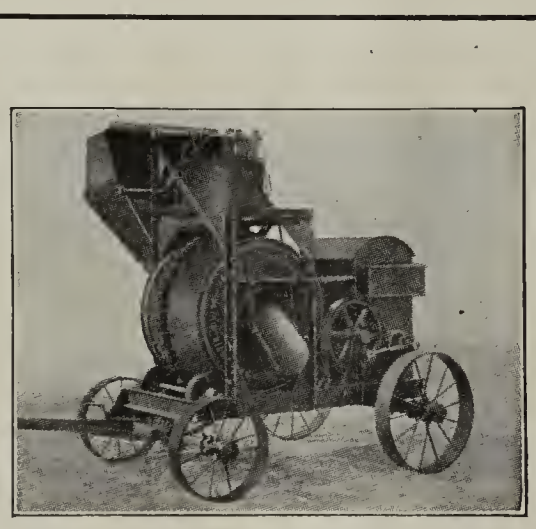
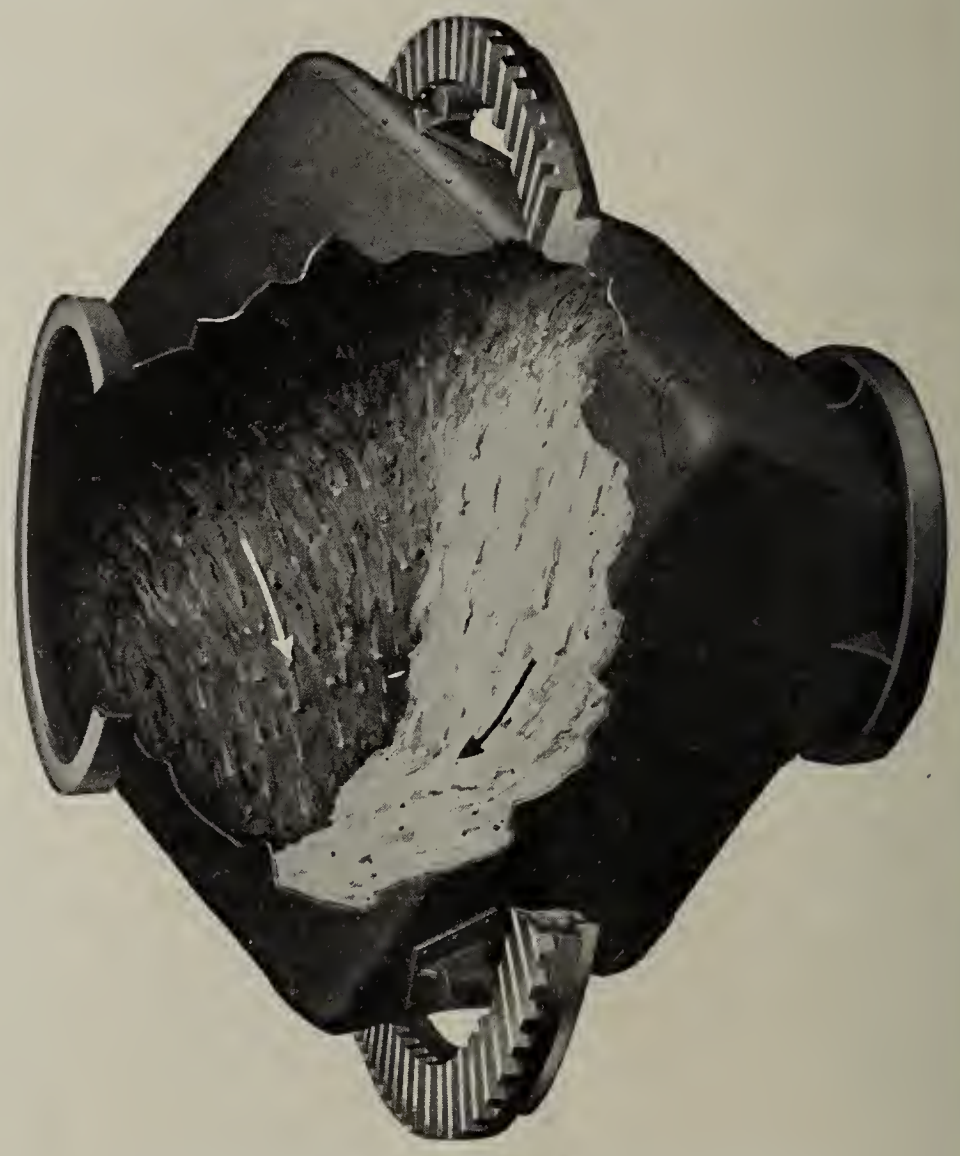
of a Money-Making Concrete Mixer is the ability to Mix Scientifically.

Say all you please about operating speed, efficiency, dependability, etc., the one thing you require of a mixer first, last and all the time is the ability to produce in the shortest time the best possible concrete with the materials and proportions available. That's scientific mixing — and although it costs more to buy, you can't get maximum return without it.



For those who are satisfied with the "blade" type drum the Austin Drum Mixer is a most logical piece of equipment. Nowhere has it found its equal in round drum mixers.

If a mixer of this type is desired ask for Catalog 21-D



## AUSTIN CUBE MIXERS

mix by kneading the mass as a unit. Study the cube. Imagine it to revolve. Note the zig-zag travel of the center line and how the alternating angle of each opposite side, as it comes up, folds the upper portion of the mass over upon itself, always toward and past the center.

That's scientific mixing.

That's "Cube" mixing.

That's the greatest money-making feature known in mixer design.

And that's why you could afford to pay for a "Cube" almost double the price of an ordinary drum mixer.

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# Superior Tile and Culvert Forms

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**Capital $200,000.00**

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Jaeger Mixers **make** good because they are **made** good. No useless parts—no skimping. They are big enough for the big jobs and not **too** big to handle the little ones with profit.

And there's a Jaeger Mixer that just fits **your** needs. Let us tell you about it.

## The Jaeger Machine Company

212 Rich St.
Columbus,
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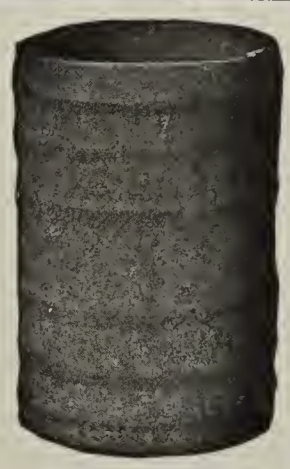
## The Biggest Tile Business on Record



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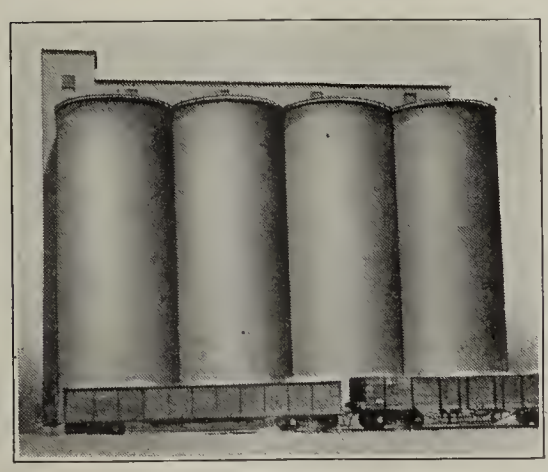

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Let HOAG Build your Stock House

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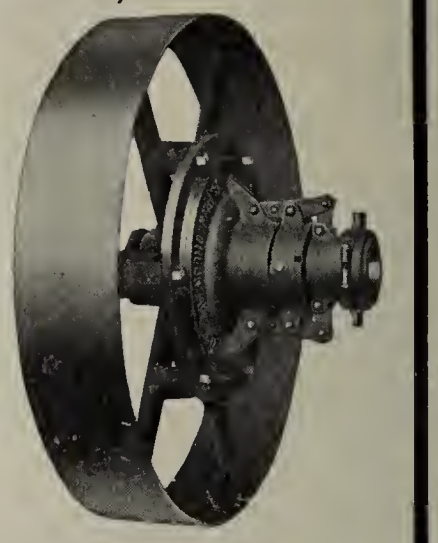
The High Cost of Power Is Reduced to a Minimum By the Use of a

## Plamondon Disc Type Friction Clutch

The power of this clutch is unusual. The double toggles on this clutch develop such tremendous pressure that even on the largest clutches only a hand lever is needed to engage or disengage the clutch. The geared devices usually needed to operate large clutches are unnecessary.

This is only one of the practical advantages the cement mills find in this clutch. Write for our new catalog No. 59 and learn the rest of them.



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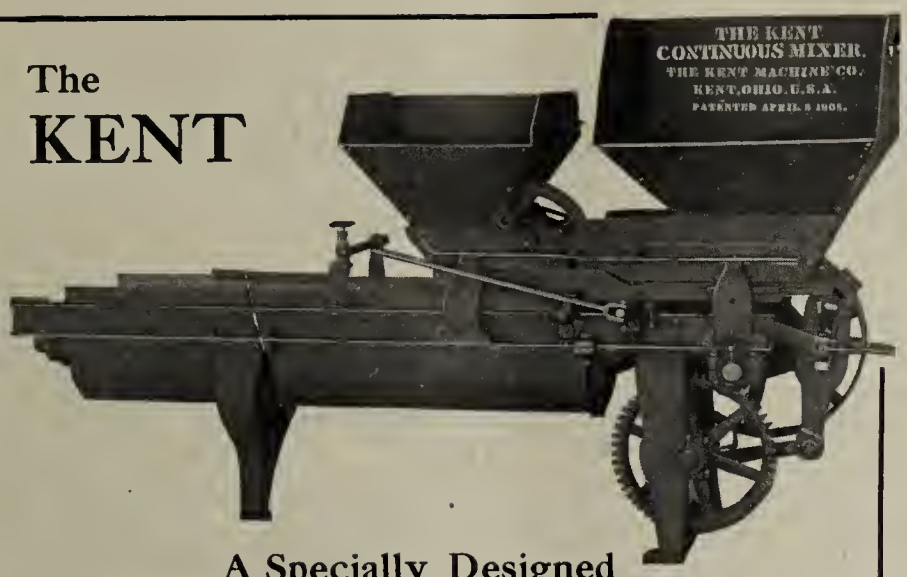


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**Mixer for Products Plants**

Seventy per cent of the bigger block, tile, brick and specialty concrete products plants of the country use the famous Kent Mixer.

Equipped with automatic feeding device, it makes certain a proper proportioning of aggregates and being continuous in operation, it saves time and labor. The biggest concrete products plant in the world has found that four Kent machines will mix fast enough to keep its many tampers and mold machines busy.

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**for CONCRETE REINFORCEING**

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QUALITY SERVICE

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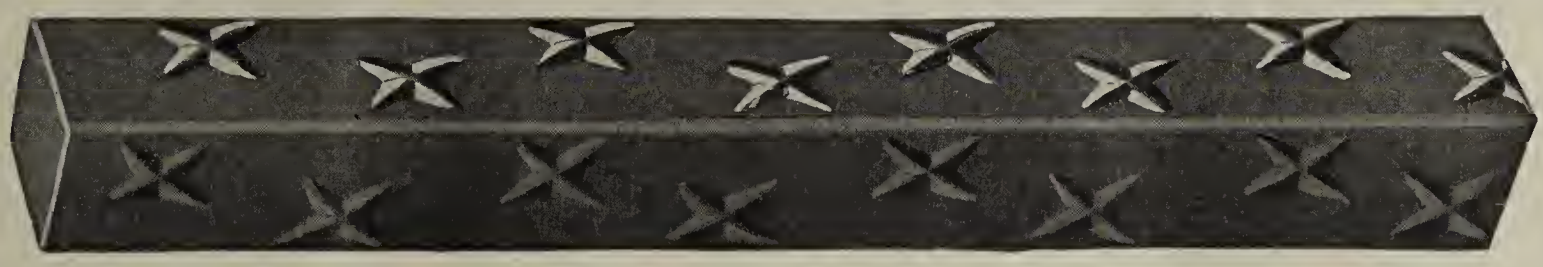

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**BARGAIN** if taken immediately, on account of old age and sickness. May divide.

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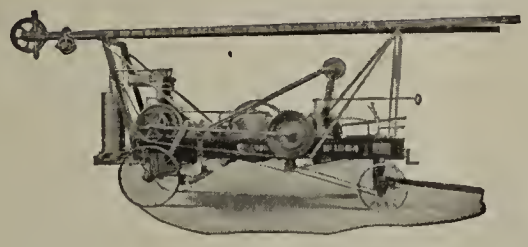

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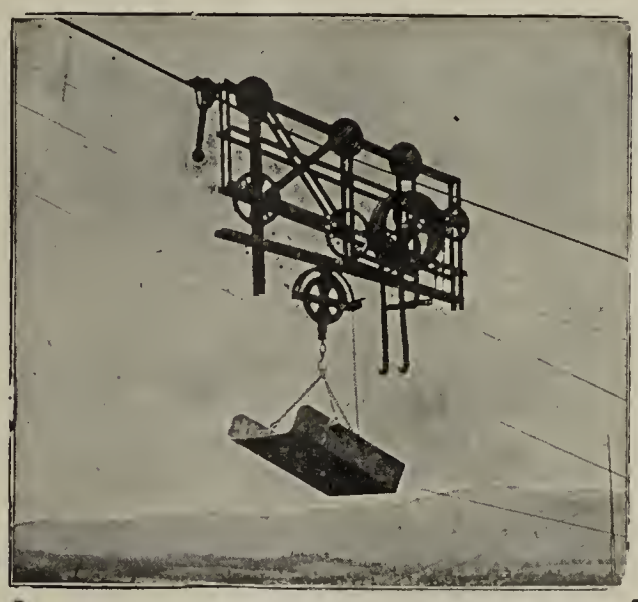

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Suspended over Slate Quarry

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The **Rugged Ruggles** is made for special use on cement and gravel construction work. For all kinds of quarries where the waste is taken from the pit and dumped at the surface. It will take any load up to **ten** tons, from any depth to the cable, where it is automatically released and sent either up or down the cable and dumped in mid-air or lowered. One man can operate three **Rugged Ruggles** on as many cables with a three-drum engine:

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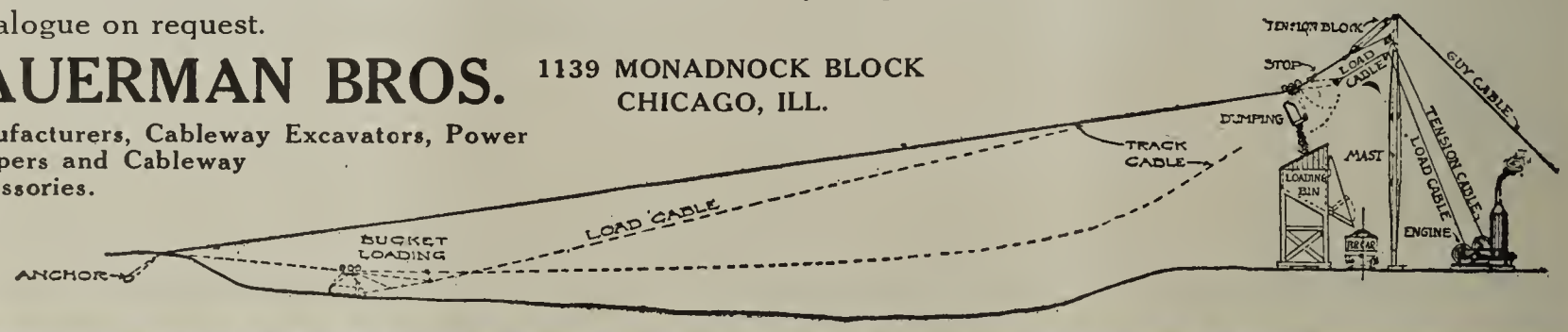
Are you using one machine for digging the material and another to convey it to the plant when you could just as well use one machine for the combined operation, saving the additional labor, machinery and upkeep cost?

The Sauerman Dragline Cableway Excavator is digger, conveyor and elevator combined in one.
It is the direct method from pit to plant.
It digs, conveys, elevates and dumps in one continuous forward operation.
Operated by a double drum friction hoist under one man control.
One Machine—One Operation—One Man Control
If you are interested in the application of this machine to your plant write us for further information.
Catalogue on request.

**SAUERMAN BROS.** 1139 MONADNOCK BLOCK CHICAGO, ILL.

**Manufacturers, Cableway Excavators, Power Scrapers and Cableway Accessories.**

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We have the most business-like silo proposition on the market for the man who will push these silos in your community. There is no territory to buy, no royalty to pay. We will start our representative "right." If you are interested in securing this business, write for full information NOW. Don't delay and let a neighbor get your territory.

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*Correspondence solicited*

## The American Clay Machinery Co.

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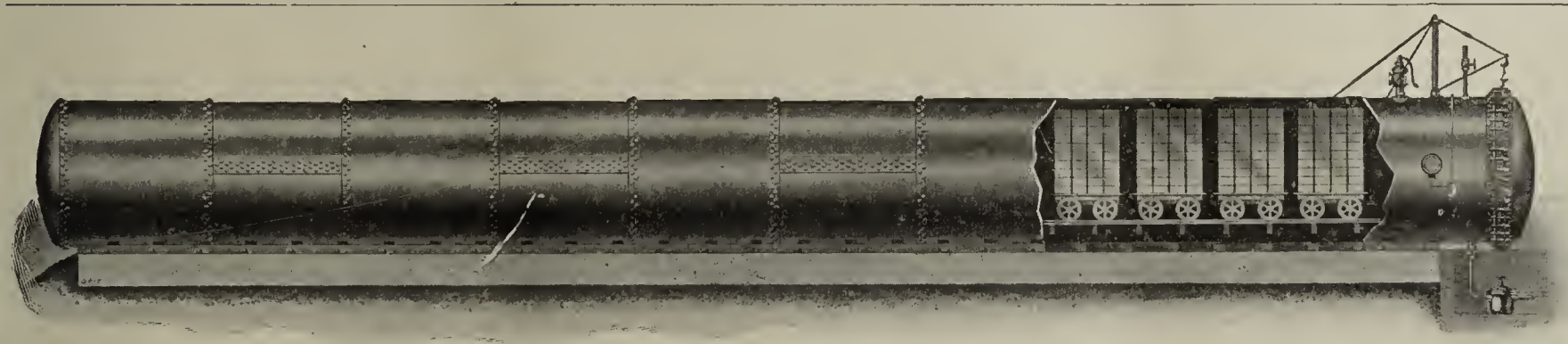

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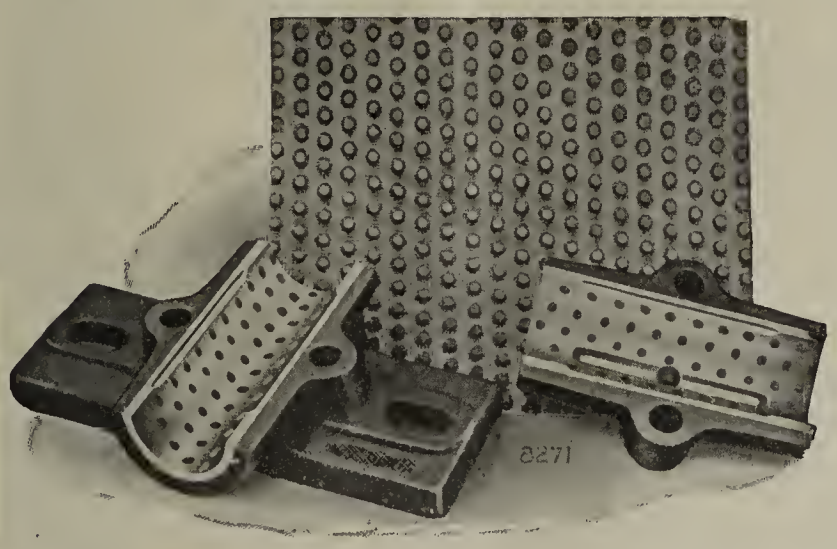
**PREPARE YOURSELVES NOW** against the serious problems of labor and coal shortage. You must utilize all improved mechanical and lubricating devices as will increase your present production to the fullest extent.

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**Will increase the life of your Bearing 300 to 400 per cent**

It will enable your bearings to stand up under heavy pressure and high speed without heating, assuring an appreciable increase in operating efficiency with a substantial saving in operating cost. In addition to the economies of oil, babbitt metal, time and labor, the slight amount of oil required for bearings so equipped overcomes all oil soaking in the belt, and the saturating of the machinery with oil is also avoided. This simple device will displace sufficient bearing metal to pay for the cost of the lubricator.

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THIRTY thousand feet of BLACK GIANT DOUBLE STITCHED BELTING in sizes ten to twenty-four inch eight ply furnished within the last sixty days to two of the largest cement plants in the United States. Both of these plants have used BLACK GIANT DOUBLE STITCHED BELTING for the past five years. BLACK GIANT DOUBLE STITCHED BELTING is the most improved cotton belting manufactured today and is adapted for all kinds of work wherever machinery is run, either for transmission of power, elevators or conveyors.

*Manufactured exclusively by*

**McIlroy Belting and Hose Co.**

**Hammond, Indiana, U. S. A.**

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"V-B" Balata
"AMPERE" (Canvas Stitched)
"WHITE SEAL"

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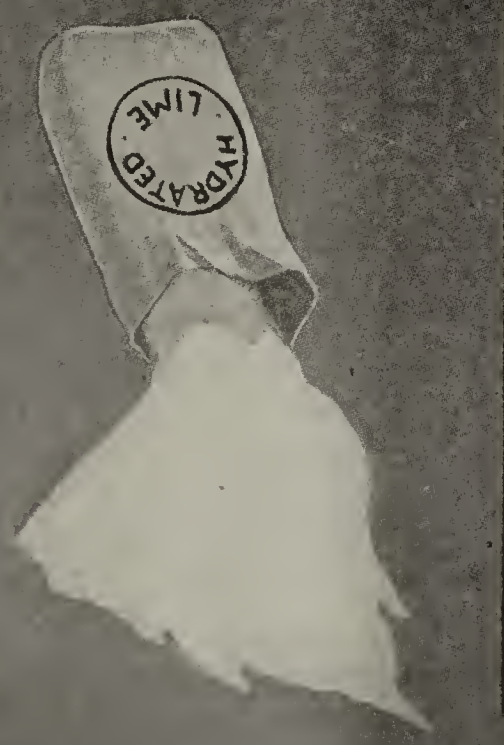
# The story of HYDRATED LIME




## SHOOTING CONCRETE 4,000 FEET

Out at San Francisco the Twin Peaks Tunnel is being built by R. C. Storrie & Co. It passes through water bearing soil and City Engineer M. M. O'Shaughnessy specified Hydrated Lime in the concrete to make the structure waterproof, eight pounds of hydrate being used to one hundred pounds of cement; the concrete proportions being 1 cement, 2¼ sand and 5 crushed gravel, graded from ¼ to 1¼ inches.

R. C. Hackley, engineer for the contractor, writes:

"On this work the pneumatic concrete placing system is used and we have shot the concrete twenty-six hundred feet through eight-inch pipe and expect to extend this line to four thousand feet or more; the lime being a great help as a lubricant. Where chutes are used they can be much flatter and will carry the concrete much farther with lime in the mix; in fact we have used lime for this purpose and for easier placing in narrow walls and around reinforcement, even when not specified, on account of the labor saved.

"The uniformity of the concrete on this piece of work and the absence of honeycomb patches can be greatly attributed to the use of Hydrated Lime."

*Write any of the following competing manufacturers of Hydrated Lime for complete information about Hydrated Lime in Concrete.*

**Marblehead Lime Co.,**
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**Tidewater Portland Cement Co.,**
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**Lee Lime Co.,**
Lee, Mass.

**Glencoe Lime & Cement Co.**
St. Louis, Mo.

**Ste Genevieve Lime Co.**
St. Louis, Mo.

**Dutchess County Lime Co.,**
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**Palmer Lime & Cement Co.,**
103 Park Ave., New York, N. Y.

**Rockland & Rockport Lime Co.,**
New York—Rockland, Maine—Boston

**The A. & C. Lime Co.,**
Canton, Ohio.

**Kelley Island Lime & Transport Co.,** Cleveland, Ohio.

**National Lime & Stone Co.,**
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**Ohio Hydrate & Supply Co.,**
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**John D. Owens & Son Co.,**
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**Woodville Lime & Cement Co.,**
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**Riverton Lime Co.,**
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1000 tons new O. H. 90 lb. ASCE rails with splices. Will quote on entire quantity or on such lots as required for prompt shipment.

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BOOK BUILDING
DETROIT, MICHIGAN

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CLAYTON, N. J.

One No. 4 March-Capron Concrete Mixer, without power, weight 7,000 lbs. Price 4c lb.

One Steel Cage, Hoppers, Wire Rope, etc., 5c lb.

One 5,000-lb. capacity two-drum Thomas Electric Hoist with 50 H.P. Motor; needs repair; $750.00.

One 28 H.P. Charter Gasoline Engine, $350.00.

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Add to the above rates, 50c for each additional person.
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**Condition Like New—Used But Thirty Days**
**$775.00 f.o.b. Chester, Pa.**
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Dealers in
"Used" but not "Abused" Machinery

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**430 West Main Street** **HARTFORD, MICH.**

# READY FOR SHIPMENT

### LOCOMOTIVE CRANES

1—12-ton Orton and Steinbrenner, 8-wheel, M. C. B. 40-ft. boom, bucket drums.

### LOCOMOTIVES

2—Baldwin, standard gauge, saddle tanks; one 33-ton, the other 35-ton; cylinders of both 14x24; four driver type; Hunt's inspection certificate of approval furnished.
Baldwin, 7½ ton, 24-in. gauge, saddle tank.

### AIR COMPRESSORS

Ingersoll-Rand duplex, two-stage, steam driven, capacity 1,190 ft. air at 110 lbs. pressure.
1—Rand belt driven air compressor, capacity 300 ft. air at 100 lbs. pressure.

### CONCRETE MIXERS

2—Marsh-Capron ¾-yard, with steam engines and boilers mounted on wheels. Charging hoppers or side loaders.
1—Marsh-Capron 1 yard, mounted on steel skids (no power), charging hopper, electric or steam power can be applied.
1—No. 4 Smith with steam engine on skids.
1—Lot concrete spouting, size 14½" wide, 9¾" deep; hopper connections.

### CARS

4—1-yard capacity "V" shaped steel two-way dump, 30" gauge.
2—24" gauge Orenstein Arthur Koppel Dump Cars.

### BOILERS

4—200 H. P. (Heine type) water tube boilers.

### MINE HOISTS

Lambert, 10x12 double cylinder, single drum, 36-in. dia., 24-in. face. Drum grooved, will take up ⅞-in. cable. Drum flanges 8 in. deep. Link motion.
Brownhoist, 9x12 double cylinder, single drum, 48-in. dia., 36-in. face, friction type. Drum grooved for ⅝-in. dia. cable.

### DERRICK HOISTS

1—American 5½x8 double cylinder, double drum with boiler.
1—National 7x10 double cylinder, double drum, with boiler.
1—Flory, 7x10 double cylinder, double drum, with boiler.
2—Byers, 16 H. P. double cylinders, double drum, equipped with boilers and swinging gears.

### VULCAN HAMMER

1—No. 1 Vulcan steam pile hammer with McDermid base.

### WIRE ROPE

450 ft. ¾-in. (one piece) plow steel.
200 ft. ⅝-in. (one piece) plow steel.
312 ft. ⅝-in. (one piece) plow steel.
500 ft. ⅝-in. (one piece) plow steel.
850 ft. ⅝-in. (one piece) plow steel.
257 ft. ⅝-in. (one piece) plow steel.
850 ft. ⅝-in. (one piece) plow steel.

### PORTABLE TRACK

About 500 ft. of 20-lb. portable track and rails in 15-ft. sections.

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**1601 Monadnock Building** **CHICAGO, ILL.**

# BARGAINS
## Immediate Delivery

### HOISTS

8¼x10 in. Morrison, D.C., D.D.
7 x10 in. Stroudsburg, D.C., S.D.
9½x12 in. Lambert Cableway Engine

### ELECTRIC HOISTS

75 H.P. Flory, 3 drums and swinger, 440 volt, 60 cycle.
40 H.P. Lambert, D.D., 220 volt, D.C.
21 H.P. Lidgerwood, D.D., 550 volt, D.C.

### CRUSHERS

9x16 in. Climax.
10x22 in. Climax.
9x15 in. Champion
No. 5 Austin
Also several rotary screens

### BUCKETS

6—2½-yd. Lockwood bottom dump.

### COMPRESSORS

16x16x24x18 in. Ingersoll, 2 stage
10x 8x10x16x10 in. McKiernan, 2 stage
12x12x18 in. Laidlaw, straight line
12x12x12 in. Ingersoll, straight line
10x12x10 in. Ingersoll, straight line
16x10x10 in. Ingersoll, 2-stage, belt driven

**Also Pipe, Suction Hose, Etc.**

**WICKES MACHINERY CO.**
Claremont and West Side Aves.
Jersey City, N. J.

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***Owned By Us and Sold Under Absolute Guarantee***

### STEAM SHOVELS

1—95-C Bucyrus, shop number 1302.
5—70-C Bucyrus, shop numbers 1474, 1351, 1126, 1287, 1245, 2½-yd. dippers.
2—Standard 70-ton Bucyrus, shop numbers 733 and 572, 2½-yd. dipper.
2—45-C Bucyrus, shop numbers 1297, 1202; 1½-yd. dippers.
1—Model 60 Marion, shop number 1685.
1—85-C Bucyrus, shop number 1647, 4-yd. dipper.

### DRAG LINES

1—No. 2 Monighan and one Lidgerwood, on skids and rollers. 60-ft. boom, 2-yd. buckets.
1—Class 24 Bucyrus dragline on skids and rollers, 100-ft. boom, 3½-yd. bucket, equipped with electric light plant, also two extra buckets and a large amount of extra parts.
1—No. 1 Monighan all steel gasoline machine, mounted on walking device, equipped with 40-ft. boom and 1-yd. Page bucket.

### DUMP CARS

20—16-yd. standard gage Western air dump cars, with steel lined floors.
50—12-yd. standard gage, Western air dump.
15—12-yd. standard gage Oliver air dump.
100—3-yd. and 4-yd., 36-in. gage Western cars.
30—1½-yd., 24-in. gage.
7—Heavy duty, 4-yd. Western, 36-in. gage dump cars.

### LOCOMOTIVES

1—17x24 10-wheel Baldwin; Driving wheel centers 50"; driving wheel base, 13' 10"; weight on drivers, 84,000 lbs.; total weight, 164,000 lbs.; steam pressure, 180 lbs. Overhauled October 1, 1917. First class condition.
1—6-wheel 17x24 Big Four Switcher, with 8-wheel tender; weight on drivers, 87,200 lbs.; steam pressure, 140 lbs.; wheel base, 13' 8"; tractive force, 16,200 lbs. Now being overhauled. Ready for delivery 10 days.
1—16x24 4-wheel Davenport Switcher, with 8-wheel tender. Weight on drivers, exclusive of tender, 37 tons—47½ tons including tender. New in 1914. Has seen very little service.
1—11x16 cylinder 21-ton standard gage Davenport saddle tank locomotive. New in 1912. Westinghouse air brakes, automatic couplers, steam pressure, 165 lbs.
2—11x16 cylinder, 36" gage, Davenport saddle tank dinkies, practically new.
1—10x16 cylinder 18-ton standard gage Davenport saddle tank locomotive; automatic couplers, steam brakes, steam pressure, 145 lbs.
1—16x22 4-wheel switcher, C. M. & St. P., J-2 class, weight, 32 tons.
1—18x26, 8-wheel passenger type locomotive, Schenectady build; total weight, 51 tons; weight on drivers, 33 tons.
5—36-in. gage, 10x16 and 9x14 Davenport saddle tank locomotives.
2—7x12 in., 24-in. gage Davenport, shop number in the twelve hundred.

### REVOLVING TRACTION SHOVELS

1—25B Bucyrus traction shovel, shop number 1850, 1¼-yd. dipper; also special long dipper arm and ⅞-yd. dipper in addition to the standard equipment.

### RAIL, SWITCHES, SPIKES, ETC.

30—Complete switches for 60-lb., 70-lb. and 75-lb. rail, complete with target switch-stands, frogs, points, etc.
1—Carload 4½", 5" and 5½" spikes.
10 tons angle bars for 70-lb. and 75-lb. rail.
100 tons 52-lb. rail.

### SPREADER CARS

1—Standard Western spreader, almost new.
1—Standard, all-steel Jordan air spreader.

### SHOP EQUIPMENT

3—Brownell, 72"x18', Horizontal Tubular Boilers, with 4" tubes.
2—20x22¼x14¼x21 AA2 Ingersoll-Rand Compressors, complete with fittings.
1—20x22¼x15¼x21 AA1 Ingersoll-Rand Compressor.
1—66x18 Vertical air receiver, complete.
1—30x6 Vertical air receiver, complete.
1—16x16x18-in. Laidlaw-Dunn-Gordon Air Compressor with reservoir, weight 15,000 lbs.
1—Tire Lathe, 52-in. Swing, complete with countershaft.
1—Stationary Engine; horizontal center crank type; 10x12-in. cylinder, slide valve type; 25 H. P.

## CLAPP, NORSTROM & RILEY EQUIPMENT CO.

**12 and 14 South Canal St., Chicago** **Northwestern Branch: 1308 Pioneer Bldg., St. Paul, Minn.**

## Immediate Delivery

2—No. 6 McCully Gyratory Crushers equipped with manganese steel head and concaves and heavy duty shaft, standard discharge 12″ x 44″ feed openings, 34 x 16 driving pulley, weight 48,000 lbs. each, complete. Capacity 50 tons 2″ stone an hour; 120 tons 4½″ stone an hour. Bought in 1916, used only one month, excellent condition.

1—Patnoe Steel Chain Elevator complete on wood frame with geared head and driving pulley, 35′ centers, 53 elevator buckets 42″ x 19″. Bought in 1916.

1—No. 8 Geared Head Elevator complete on wood frame with 32″ 8-ply belt, 69′ centers, 105 elevator buckets 30″ x 17″. Bought in 1916.

1—Thomas 3-drum Electric Hoist equipped with latest improved boom swinging attachment with 150 H.P. A.C. Wagner motor 514 R.P.M.

1—10 x12 Chicago Pneumatic Tool Co. Air Compressor, Style GCSC, 11 x 18 x 16½, belt drive with horizontal Air Receiver 4½ x 11½, 500 cu. ft. per minute.

OSCAR DANIELS CO.
First National Bank Bldg,
Chicago



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| H.P. | | Speed |
|---|---|---|
| 1— 3 | —General Electric | 1800 |
| 1— 3 | —Westinghouse | 1200 |
| 1— 5 | —Wagner | 1800 |
| 1— 5 | —Allis Chalmers | 1200 |
| 1— 7½ | —General Electric | 1800 |
| 1—10 | —Westinghouse | 900 |
| 2—15 | —Westinghouse, Type CCL | 1750 |
| 2—15 | —Watson, slip-ring, var. speed | 1720 |
| 1—15 | —Fairbanks-Morse | 1200 |
| 1—15 | —General Electric, Form L | 1200 |
| 1—15 | —General Electric | 1200 |
| 3—15 | —Fairbanks-Morse, slip-ring, constant speed | 1200 |
| 1—15 | —Westinghouse, vertical | 1135 |
| 2—15 | —Allis-Chalmers | 1130 |
| 2—15 | —Allis-Chalmers | 860 |
| 2—15 | —Westinghouse | 850 |
| 4—20 | —Westinghouse | 1750 |
| 1—20 | —General Electric | 1200 |

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Capital and Surplus, $500,000.00


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### CHIEF ENGINEER WANTED

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### WANTED

Second-hand Smidth Kominuters and Tubemills. Quote price, description, location. Address P. O. Box 1941, New York, N. Y.


### COMPRESSORS

| | Price |
|---|---|
| 1—12x12 Laidlaw-Dunn Gordon, belt driven, capacity 300′ | $ 750 |
| 1—12x12x16 Ingersoll, straight line, steam driven, capacity about 300′ at 80 to 100 lb | 600 |
| 1—Sullivan, 2 stage air, simple steam, capacity 1800′ at 80 to 100 lb | 2,500 |
| 2—14x12 Bury Duplex, belt driven, capacity about 550′ at 60 to 80 lb., each | 1,000 |
| 1—14x16x10x16 Sullivan, 2 stage air, simple steam, capacity 600′ at 80 to 100 lb. | 1,500 |
| 1—14x9x10 Bury, 2 stage, belt driven, capacity 350′ | 1,500 |
| 1—Ingersoll-Rand Imperial Type XB2, 500′ | 2,000 |
| 1—Sullivan 2 stage, belt driven, 1400′ good as new, f. o. b. St. Louis | 4,500 |

### CARS

| | |
|---|---|
| 20—4 yd. Western, 2 way, contractors, 36″ gauge, wooden bodies, each | $ 125 |
| 70—2½ yd. steel bodied, end dump quarry cars, 36″ gauge, each | 80 |
| 30—2½ yd. steel bodied, end dump quarry cars, 48″ gauge, each | 75 |
| 20—12 yd. Western, standard gauge MCB, air dump cars, almost new, each | 1,050 |
| 20—12 yd. Western, standard gauge MCB, air dump cars, good condition, each | 900 |
| 50—1½ yd. Koppel "V"-shaped, 24″ gauge, steel cars, new, each | 120 |

### CRUSHERS

| | |
|---|---|
| 1—No. 9 Style "K," almost new | $7,000 |
| 2—No. 5 Austins, one straight and one angle drive, both fine condition, each | 1,500 |
| 1—No. 6 Style "D" Gates, fine condition | 2,000 |
| 1—No. 7½ Austin, almost new | 2,500 |
| 1—10x20 Blake jaw crusher on skids | 800 |
| 1—9x16 Good Roads Machinery, jaw crusher on wheels, with 22′ elevator. | 800 |
| 1—9x16 Universal on skids, almost new. | 500 |
| 1—No. 7½ McCully | 3,000 |
| 1—No. 5 McCully | 1,500 |

### ELEVATOR AND SCREENS

| | |
|---|---|
| 1—No. 5 Gates 70′ centers, almost new. | $ 700 |
| 1—No. 7½ Austin 62′ centers, fine condition | 900 |
| 1—No. 9 with 36″ buckets, good condition, without belt | 900 |
| 1—Stephens & Adamson stone screen, 42″x16′, with dust jacket, practically new | 700 |
| 1—48x18 Austin screen with dust jacket | 800 |
| 1—48x20 McCully screen with dust jacket | 900 |

### CLAM SHELL BUCKETS

| | |
|---|---|
| 1—¾ yd. Owen with teeth, almost new | $450 |
| 1—1½ yd. Hayward, first class | 650 |
| 1—1 yd. Browning | 500 |
| 1—1½ yd. Page Dragline | 500 |

### CRANES

| | |
|---|---|
| 1—7 ton, 4 wheel Vulcan Bucyrus single line crane | $ 6,000 |
| 1—10-ton Browning 4 wheeled, with bucket | 7,000 |
| 1—15 ton Brown hoist, with 50′ boom, 8 wheeled MCB, with 2 yd. Brown hoist, clamshell | 17,500 |
| 1—20 ton Brown hoist, 8 wheel MCB, 50′ boom, and bucket | 18,000 |
| 1—25 ton Browning hoist, 8 wheel MCB, 50′ boom, and bucket | 21,000 |

### HOISTING ENGINE

| | |
|---|---|
| 1—6¼x10 American DCDD, with boiler. | $1,000 |
| 1—7x10 Lidgerwood DCDD, with boiler | 1,100 |
| 1—7x10 Lambert, 3 drum, with boiler | 1,600 |
| 1—8x12 Mundy DCDD, with boiler | 1,300 |
| 1—9x10 Lidgerwood, 3 drum, 32″ drums, without boiler | 1,900 |
| With boiler | 2,300 |
| 1—Clyde 9x10, 3 drum with boiler, f. o. b. Mich. | 2,500 |
| 1—5x8 DCDD Reversible O&S, with vertical engine, without boiler | 350 |
| With boiler | 550 |
| 1—7x10 Lambert DCDD, with boiler | 1,100 |

### LOCOMOTIVES

| | |
|---|---|
| 1—9x14 Vulcan, 36″ gauge, saddle tank. | $1,250 |
| 1—9x14 Vulcan 36″ gauge, saddle tank. | 1,350 |
| 1—10x16 Vulcan 36″ gauge, saddle tank. | 1,600 |
| 1—10x16 American 36″ gauge, saddle tank, good as new | 1,850 |
| 1—19x24 Baldwin, 10 wheeler, 60 tons. | 8,000 |
| 1—18x24 American, 10 wheeler | 5,000 |
| 1—17x24 6 wheel switcher | 5,000 |
| 1—14x24 Pittsburgh, saddle tank standard gauge with separate tender | 4,000 |

### DRAGLINES

| | |
|---|---|
| 1—Monighan-Walker steam machine, with 50′ boom, 1½ yd. bucket, almost new | $7,000 |
| 1—Flory outfit engine 10x12 heavy dragline type boiler, fire box 150 lb. pressure, boom 60′, steel bucket, 2 yd. New 1917 | 9,000 |
| 1—24 Bucyrus, with 85′ boom | |

### RAIL

| | Price |
|---|---|
| 400 tons—35 lb., with angle bars | $57 |
| 1500 tons—56 lb., with angle bars | 58 |
| 100 tons—75 lb., with angle bars | 55 |

### PUMPS

| | |
|---|---|
| 1—10″ Morris, sand, belt drive | $ 500 |
| 1—8″ Morris, water, belt drive | 300 |
| 1—20x10x14 Worthington duplex | 600 |
| 1—Wilson-Snyder water works pump, complete with condenser | 2,000 |

### STEAM SHOVELS

| | |
|---|---|
| 1—No. 0 Thew on standard gauge railroad truck, ⅝ yd. dipper | $2,500 |
| 1—No. 0 Thew traction with ⅝ yd. dipper, fine condition | 4,000 |
| 1—14B Bucyrus traction with ⅝ yd. dipper, almost new | 4,000 |
| 1—18B Osgood traction with ¾ yd. dipper, high boom, one year old | 5,000 |
| 1—No. 1 Vulcan revolving shovel, standard gauge with ¾ yd. dipper, good as new | 4,500 |
| Same as above, with 35′ crane boom | 5,500 |
| 1—45 ton Bucyrus, standard gauge, 1¾ yd. dipper | 6,500 |
| 1—Model 60 Marion with 2½ yd. dipper | 7,000 |
| 1—65 ton Bucyrus with 2½-yd. dipper | 5,000 |

### CABLEWAYS

| | |
|---|---|
| 1—9x10 Lidgerwood, 3 drum engine and boiler and carriage and part of other fittings, no rope | $3,000 |
| 1—50 hp. Flory DD electric with carriage and fittings, but no rope | 3,000 |
| 1—7x10 Flory steam DCDD with boiler, carriage and all fittings, but no rope | 1,950 |

### BOILERS

| | |
|---|---|
| 1—25 hp. vertical American hoist and derrick | $250 |
| 1—40 hp. firebox on steel truck | 550 |
| 1—50 hp. vertical butt strap | 750 |
| 1—60 hp. vertical Lidgerwood | 800 |

### MOTORS

| | |
|---|---|
| 1—20 hp. Westinghouse, 60 cycle, 3 phase, 220 volt | $400 |
| 1—30 hp. Westinghouse, 60 cycle 3 phase, 2200 volt | 450 |
| 1—35 hp. Westinghouse, 60 cycle 3 phase, 2200 volt | 500 |
| 1—50 hp. General Electric, 60 cycle 3 phase, 220 volt | 750 |

## MACHINERY WAREHOUSE & SALES COMPANY,

*Successor to* GEO. C. MARSH & Co.

**Tel. Harrison 5799**

**750 Old Colony Bldg., Chicago**

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# BUYERS' DIRECTORY OF MANUFACTURERS OF MACHINERY, EQUIPMENT AND SUPPLIES

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Ruggles Machine Co.

### Ball and Tube Mills
Allis-Chalmers Mfg. Co.
Bonnot Co.
F. L. Smidth & Co.
Traylor Eng. & Mfg. Co.

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McIlroy Belting & Hose Co.
Sawyer Belting Co.
Victor Balata & Textile Belting Co.

### Buckets—Clam Shell
Link-Belt Co.

### Burial Vault Molds
Automatic Sealing Vault Co.

### Cement Finishing Tools
Abram Cement Tool Co.
Arrowsmith Concrete Tool Co.
Ideal Concrete Machinery Co.

### Cement Mill Machinery
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Bonnot Co.
Bradley Pulverizer Co.
Clark Dust Collector Co.
The Jeffrey Mfg. Co.
F. L. Smidth & Co.
Sturtevant Mill Co.
Traylor Eng. & Mfg. Co.
Williams Pat. Crusher & Pulv. Co.

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Henry Heil Chemical Co.

### Chimneys
Weber Chimney Co.

### Clutches
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Archer Iron Works.
F. C. Austin Co.
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Kent Machine Co.
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B. F. Gump Co.
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Link-Belt Co.

### Cranes, Locomotive
Link-Belt Co.

### Crushers
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Austin Mfg. Co.
Chalmers & Williams, Inc.
The Jeffrey Mfg. Co.
Traylor Eng. & Mfg. Co.
Universal Crusher Co.

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Sasgen Derrick Co.

### Drills (Blast Hole)
Sanderson-Cyclone Drill Co.

### Dump Cars
Western Wheeled Scraper Co.

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The Jeffrey Mfg. Co.
Daniel B. Luten.
Richard K. Meade.
F. L. Smidth & Co.
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Automatic Sealing Vault Co.

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Ganschow Co., Wm.
A. Plamondon Mfg. Co.
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### Marble (Crushed)
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Concrete Steel Co.
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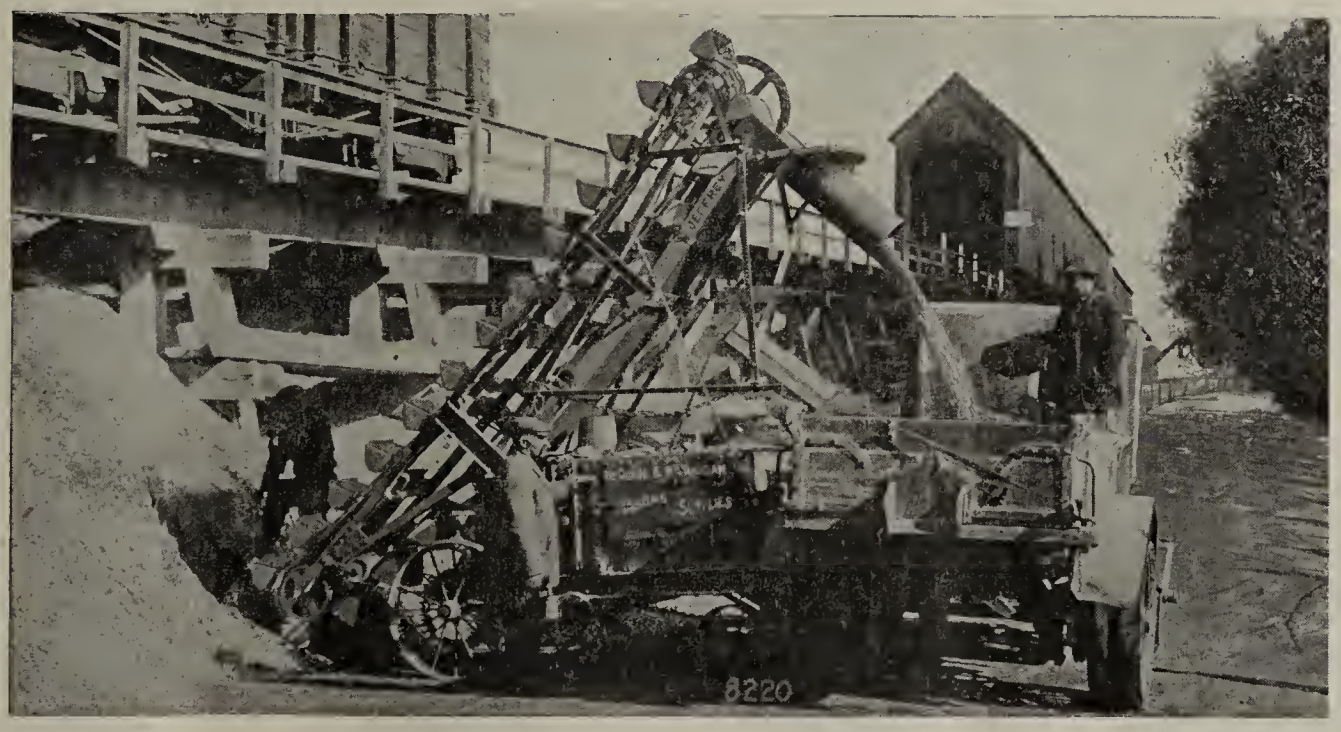
## A Gang of Shovelers On Your Pay Roll at War-Time Wages OR




## A Jeffrey Self-Propelling Loader That Saves 5 to 10 Men and Handles More Material

Hundreds of Contractors, Building Supply Dealers, Manufacturers, and others have found the Jeffrey Loader a highly profitable investment.

*Write for Loader Bulletin No. 177-L*

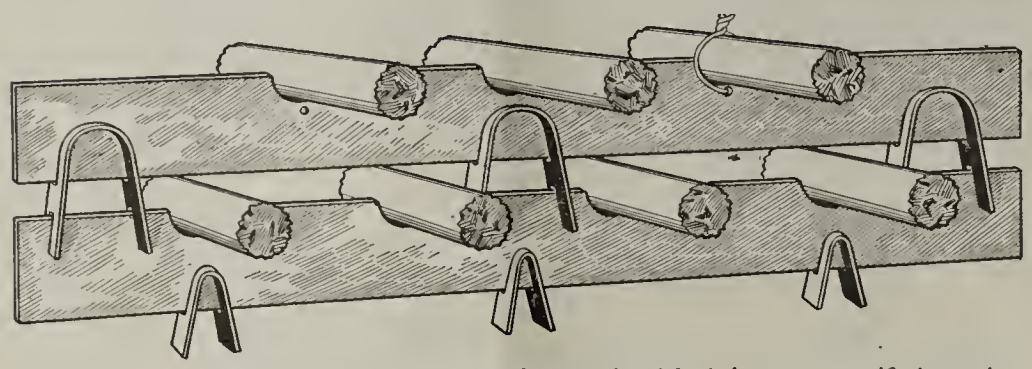
*Address Loader Dept.*

## The Jeffrey Manufacturing Co.

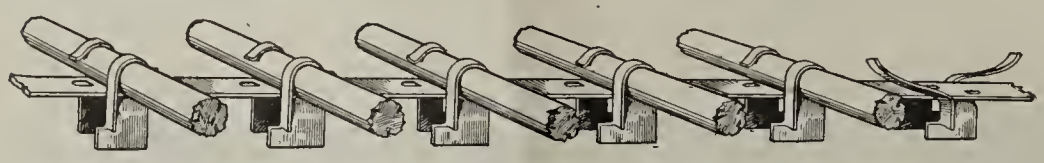
914 North Fourth Street Columbus, Ohio

# UNIVERSAL Concrete Specialties

## *for Engineers and Contractors*

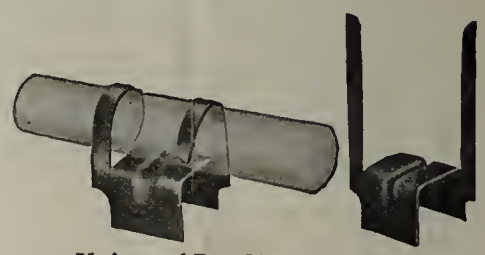


Universal Beam Saddle. Made of steel. Can be furnished for any specified number and size of bars, spacing and height.

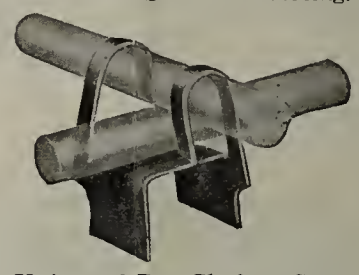


Universal Slab Spacer. Made of steel. Can be furnished for any specified length, size of bar and spacing. Standard height ¾ in.

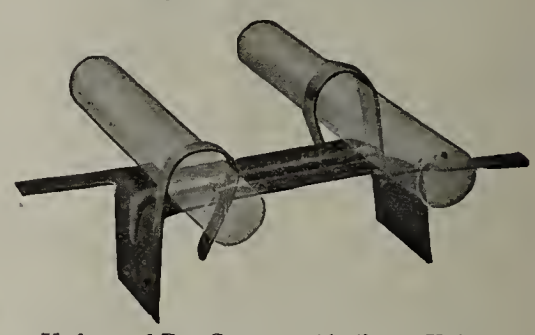
Universal Slab Spacer for second course rods. Laid on top of and at right angles to first course. Furnished for any desired length, spacing or size of rods.



**Universal Bar Chair:** Made of steel. Illustration above shows use with single rod reinforcing.



**Universal Bar Chair.** Same as above. Use for 2-way reinforcing.



**Universal Bar Spacer.** Similar to Universal Bar Chair. Spacing, 4 in., 5 in., or 6 in.

**Universal Form Clamp.** Made to hold rods of any size. Most economical for wall, beam, soffit and column forms. Easily and quickly placed or removed.

**Universal Wire Clamp.** Unmatched for wall form work. No boring of holes or driving of nails required. Great holding power.

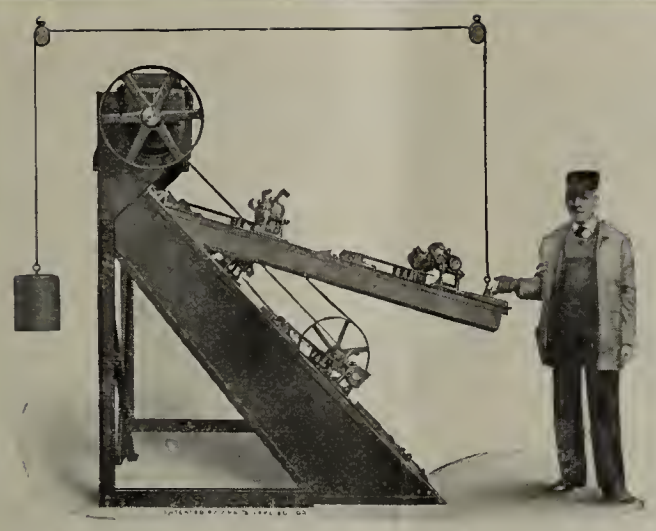
**Universal Rod Puller.** A one-man tool. Pulls rods from concrete after it has taken initial set. Indispensable in retaining wall form work.

**Universal Rod Tightener.** One man operates it. Pushes clamp into place and holds it there until screw is set.

## *A Complete Line*

**Send for information on any or all of these time- and money-savers**
**Samples of all of the above sent free. Write today.**

# UNIVERSAL FORM CLAMP CO., 20 N. May St. CHICAGO



# STURTEVANT NEWAYGO

**ONE FINGER opens the door of the Sturtevant-Newaygo**

## SUPER-SCREEN

and exposes the Scalper Screen, located in the Cover and which may be pulled out like a drawer. The Fine Screen resting in the Screen Box unobstructed by any mechanism and may be removed by lifting it out. Such accessibility has heretofore been unknown.

UNIT CONSTRUCTION

Each Unit has screens 6x3 ft. and is a complete Separator in itself. Each part is interchangeable and of the most efficient size for vibrating, capacity, handling, repair, etc. By simply bolting units together a Separator of any reasonable capacity is obtained.

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The vibration is really wonderful and yet nothing comes in contact with the wire cloth except the material being screened. This cloth is stretched taut and held taut and the tension may be regulated locally or in its entirety. Hammers jar elastic bridges far above the screen cloth which transforms these shocks into high pitched vibration when transferred to the wire clothing. The Scalper is also vibrated.

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**STURTEVANT MILL COMPANY, BOSTON, MASSACHUSETTS**

15/16 IN. HY-RIB (SEVEN-RIB). Ribs 15/16 in. high, 4 in. apart; sheets 24 in. wide.

# Insure Your Building Results

by using the complete line of material for use in all types of construction. Be sure of prompt delivery, as our complete stocks and large organization warrant immediate shipment.

## HY-RIB and RIB LATH

the acknowledged standard material, as used everywhere in all kinds of construction work.

The many depths, gauges and types of Hy-Rib adapt it to reinforcement of concrete floors and roofs. It is an ideal plastering surface for walls and ceilings and renders the building entirely fireproof. Easily put in place and on arched and curved work it is furnished bent to the exact curve.

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*Representatives in Principal Cities*

**For Concrete Roads**

Kahn Road Mesh
The most efficient reinforcement for concrete roads and pavements.

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Protect and reinforce concrete curbs.

Kahn Armor Plates
Perfectly protect expansion joints.

Write for Highway Pamphlet and estimates.

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comes to the man who is well equipped to build monolithic concrete grain tanks, coal pockets, water towers and silos. No man is well equipped to do all this unless he has a **Polk System** machine. Write today for your copy of our catalog.

**POLK GENUNG POLK COMPANY**

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We make a specialty of supplying cement works with

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**High Grade Goods Only**

*Satisfaction Guaranteed*

*The Seal of Dependable Performance*

ACME THE TRUCK OF PROVED UNITS

*Trade Mark Reg. U. S. Pat. Off.*

# The Mighty ACME Truck Saves Money, Time, Man-Power

Haulage is a decidedly vital factor in the gravel and stone business. Constant truck service at low fixed cost is extremely important.

Constant truck service – at lowest fixed cost—is Acme Truck Service. Comparative figures show Acme leadership, both in economy and performance.

Acme quick loading and unloading features—plus Acme proved units—mean the utmost in service to the gravel and stone industry. They mean big saving, too, in money, time and man-power.

## ACME Proved Units Are Combined Perfections

The master products of sixteen master manufacturers are built into the Acme Truck. Acme proved units are combined perfections. Each stands for supremacy.

**HELP WIN THE WAR**

*Relieve the Railroads*

**Reduce your delivery costs and end delay with the ACME in your service**

## Write For New ACME Book

THIS valuable book is crowded with facts and figures of interest to every man in whose business haulage is a problem. It's titled "Pointers to Profits"—a valuable guide book to delivery profits. Write on your letterhead for a copy.

## Acme Motor Truck Co.

74 Mitchell Street Cadillac, Mich.

*One-ton to Four-ton Models. Each oversized in both capacity and dimensions.*

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Ideal engines assure constant, care-free service.

As standard equipment on concrete mixers, power loaders, hoisting and pumping outfits, Ideal Engines are furnishing dependable power for the most difficult tasks.

Built to run with a minimum of care and attention, Ideal Engines are furnishing power for construction work throughout the country—cutting building costs by furnishing economical, reliable power.

Ideal Engines are light weight for power delivered; vertical type, requiring small floor space.

*Ideal contractor equipment includes Reversible Hoists, Single Drum Hoists, Double Drum Hoists, Water and Mud Pumps. Let us send you our catalog containing complete information about Ideal Engines and Outfits.*

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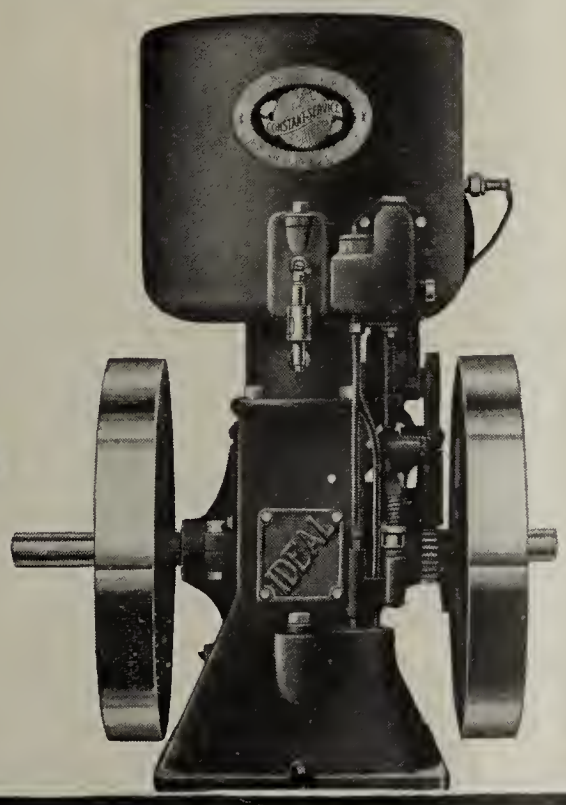
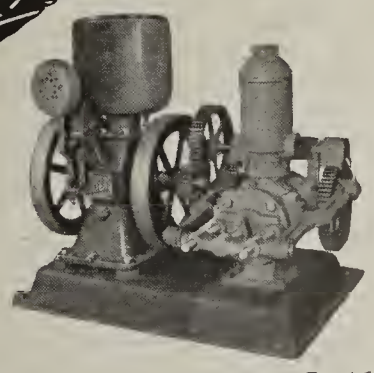
Ideal Single Drum Hoist



Ideal Force Pumping Outfit

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by using Symons Disc Crushers at all stages. Our catalogue will show you why Symons Crushers are favorites of the most experienced producers of crushed stone and gravel.

The time for action is now. Don't delay that installation any longer. Tell us your needs and let us figure with you.

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CHICAGO HEIGHTS, ILLINOIS

SYMONS DISC CRUSHER

**Here are two examples of**

## SYMONS DISC CRUSHER Performance

Size of Crusher: 24 inches. Material Crushed: Gravel and hard heads. Length of time operated: two years. Size of feed: 2 inches. Size of product: ½ inch. Horsepower used: 20. Tons crushed per hour: 25. Original crushing discs still in use. No time lost on account of breakage.

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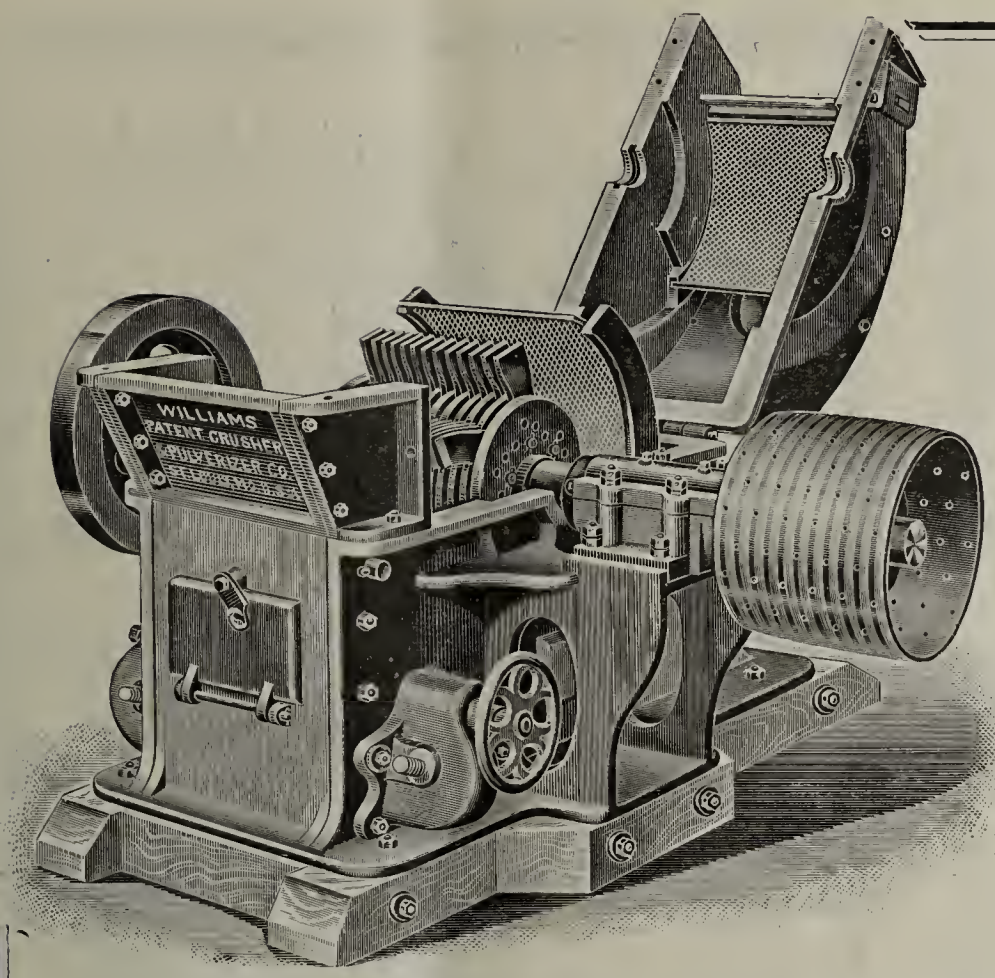


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# LIMESTONE GRINDERS

**Take 2 in. to 3 in. dry stone and in one operation, without outside screens or separators will produce 95% through 20-mesh material.**

**CAPACITIES RANGE FROM ¼ TO 30 TONS PER HOUR**

**Over 5,000 Williams Mills in Daily Operation.**

There is undoubtedly room in your plant for one of these machines, which, in the last twenty-two years have proven that they are money savers, can be depended on, and really have merit. If further information is desired, Write for Bulletin No. 17, which is brim full.

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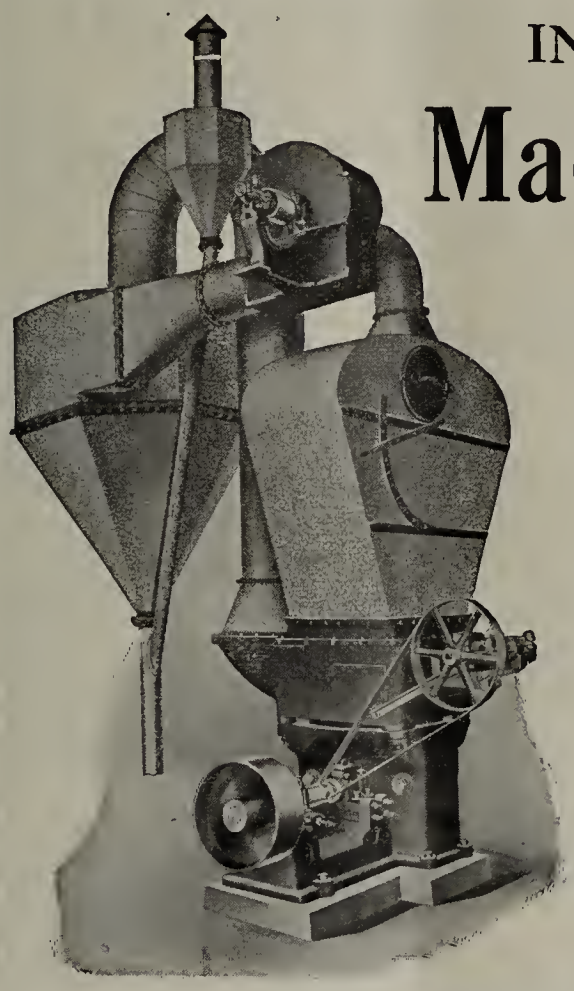

In successful use grinding Cement, Clinker, Limestone, Coal

INSTANT REGULATION OF FINENESS

NO DUST

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CANTON, OHIO

# THE OLD RELIABLE

TRADE **SAWYER** MARK
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## STITCHED CANVAS BELTING

**FOR BETTER SERVICE**

United States Rubber Co.
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## Cleveland Double-Crimped
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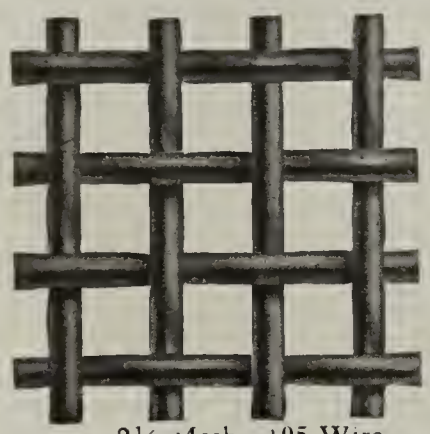
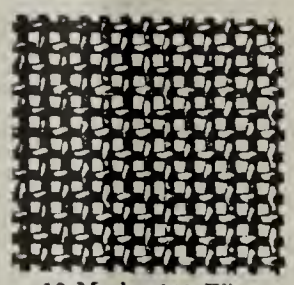


2½ Mesh; .105 Wire



1⅝ Mesh; .047 Wire

Renowned for its Uniformity, its Superior weave, its Durability. Especially adapted for SAND, GRAVEL and CEMENT Screens. A large stock of the various meshes always on hand.

***Price Right—Catalog on Request***

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## Only $160.00

Capacity
3½ cu. ft.
Wt. 900 lbs.

for this complete, all-steel power mixer, including trucks, engine and housing.

A great mixer for any class of work and good for jobs of all sizes.

**Hand or Belt Mixer $55.00**

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consists of all sizes and types of machines from 3½ to 10 cu. ft. capacity in both tilting and non-tilting types — *low charging — power loaders — all attachments.* Prices very reasonable.

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## A One-Man Car Unloader

*For Crushed Stone, Sand, Gravel, Slag, Ashes, Etc.—*

## The Sunbury Automatic Car Unloader

30 Foot Steel Continuous Bucket Elevator, 25 ton Wooden Center Discharge, Portable Bin, 8 H. P. Gasoline Engine, Coupled to the Sunbury Automatic Feeder, which is installed under track carrying the material to the elevator, is the combination that has made a cost of *50 cents per car* for unloading, easily obtained.

***Catalog will be sent on request***

MANUFACTURED BY

**The Sunbury Manufacturing Company**
**Sunbury, Ohio**

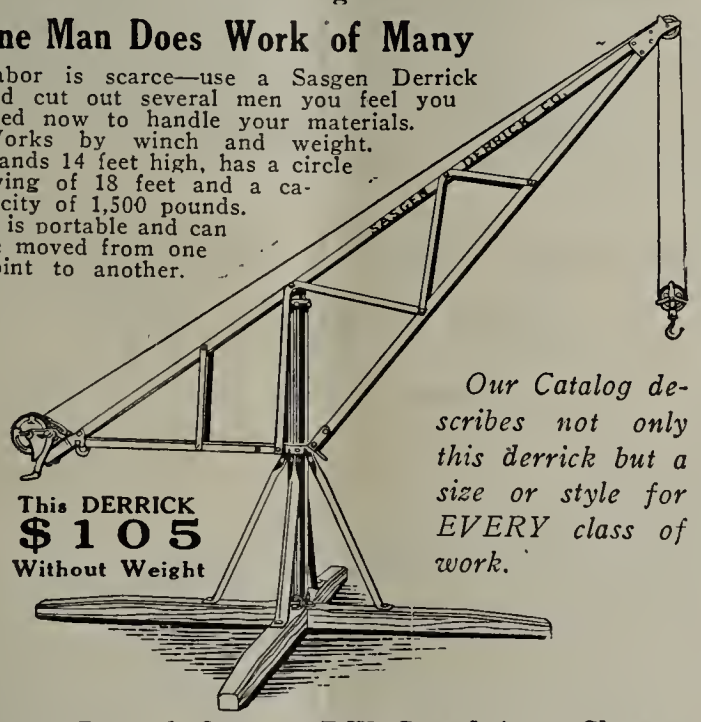
# Load and Unload

## With a Sasgen Portable Derrick

The Sasgen Circle Swing Counterweight Derrick cuts costs, labor and time oading unloading material from cars or wagons.

### One Man Does Work of Many

Labor is scarce—use a Sasgen Derrick and cut out several men you feel you need now to handle your materials. Works by winch and weight. Stands 14 feet high, has a circle swing of 18 feet and a capacity of 1,500 pounds. It is portable and can be moved from one point to another.




This DERRICK
**$105**
Without Weight

*Our Catalog describes not only this derrick but a size or style for EVERY class of work.*

**Sasgen Derrick Co., 3117 W. Grand Ave., Chicago**

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Pavers, Grouters, Hoists, Pumps,

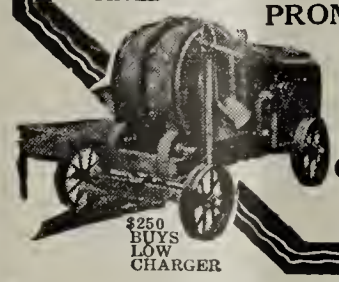
**BOSS** HIGH SPEED

Building Mixers, Backfillers, Elevators

## Contractors' Equipment

BUILT OF STEEL WITH HYATT ROLLER BEARINGS

ASK ABOUT OUR HIGH DRUM TWO BAG PAVER



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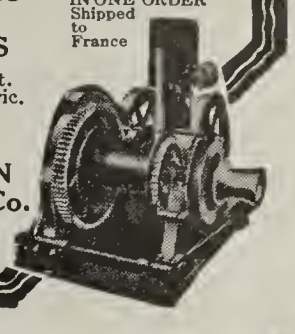

**THE AMERICAN Cement Machine Co.**
Inc.
Keokuk, Iowa

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# Crushed White Stone and Marbledust

## Adds Little To Cost—Increases Your Profits

Livens up Cement Work, Improves Appearance of concrete blocks, bricks and all concrete products; adds to looks of Stucco and is unsurpassed for brilliant Floor Finishes; Unexcelled for white plastering and exterior plastering.

We are prepared to furnish Prompt Shipment and Perfectly Crushed Materials at a short notice.

Send for samples of our material and let us quote you prices.

**CONLIN & CO. Tuckahoe, N. Y.**

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# For Facing Concrete Work

No other material can quite compare with Middlebury Terrazo. It is furnished carefully graded to size—in either dust, No. 1, 2 or 3.

It is made from Middlebury White and Creme Statuary Marbles; and when used for facing stucco work gives an appearance equal to that of solid marble, and with all the advantages of marble, at a material saving in price.

**Send for samples and prices.**

# Middlebury Marble Company

**Brandon, Vermont**

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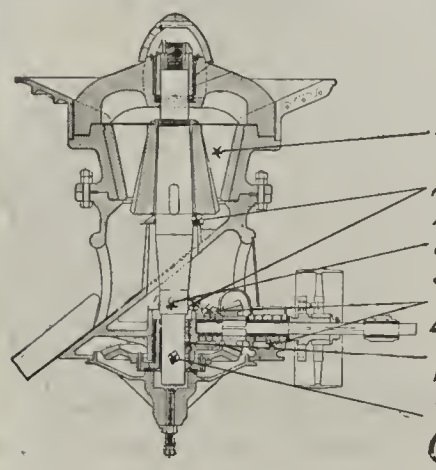
## GYRATORY CRUSHERS



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3. Automatic oil-pump and oiling system, insuring thorough lubrication of all bearing surfaces.
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6. Full eccentric bearing surface retained when head is raised.

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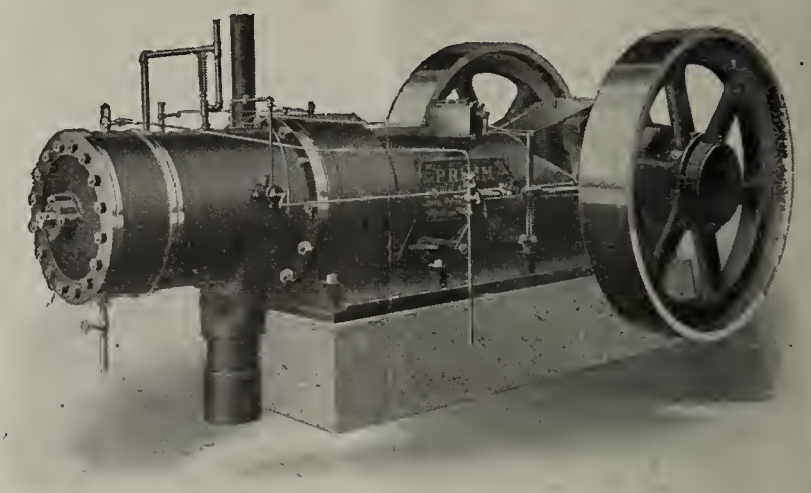

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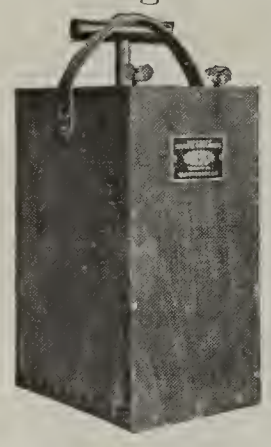

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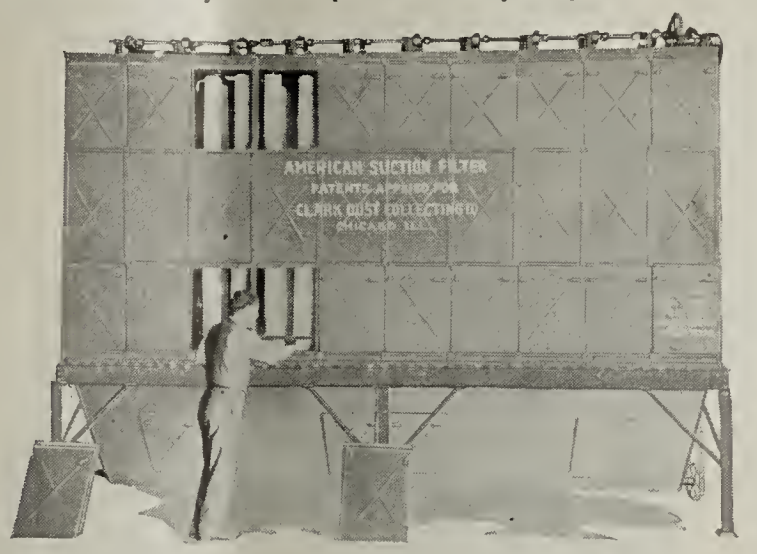


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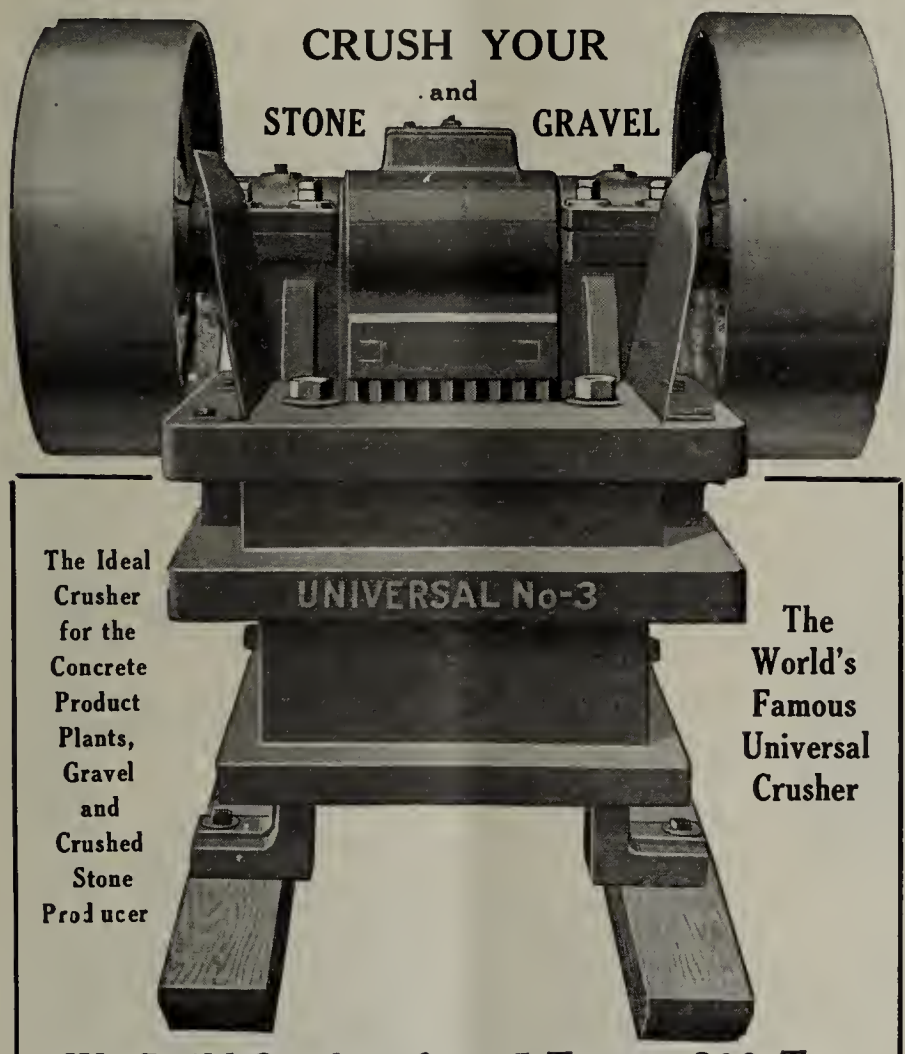


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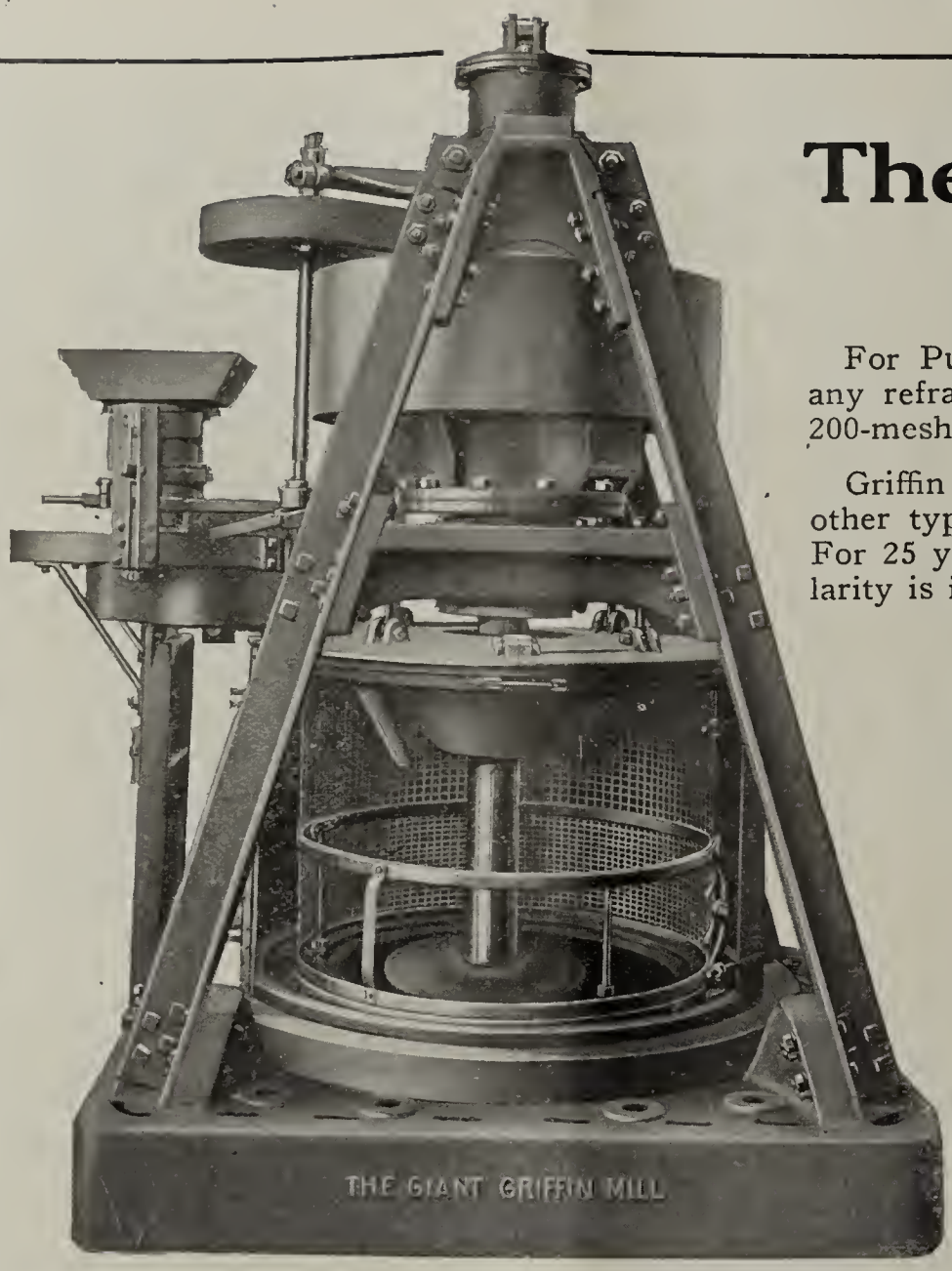


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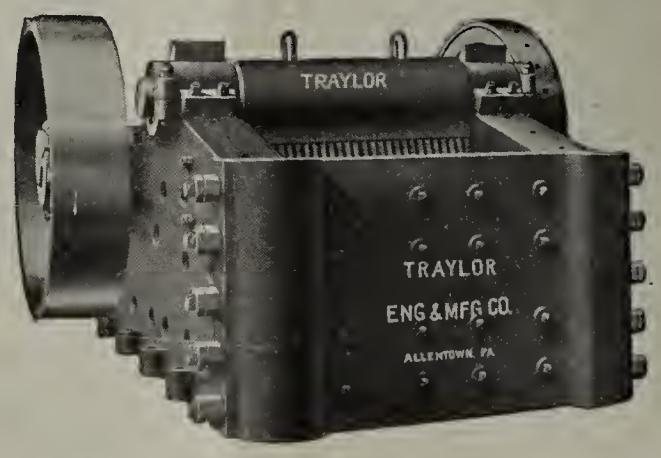


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# Cement and Engineering News

Vol. 30 July 1918 No. 7

## Build More Silos and Build Them Permanent

**An Excellent Example of Barn and Silos Built of Concrete Blocks**

A silo campaign to increase the number of silos on beef cattle farms is being conducted by the United States Bureau of Animal Industry in co-operation with State authorities and county agents. With more silos more beef cattle can be produced and economically fed during the winter. This campaign, therefore, has a direct bearing on increasing the meat supply of the Nation. The campaign is being given special attention in the southern States, particularly in territory which has recently been freed from cattle-tick quarantine, where the production of beef cattle is on the increase.

The State of Indiana is going to fight the war in the corn field. It takes the lead in promoting a silo for every farm.

The campaign already under way is without doubt the most comprehensive of its kind ever organized in America. The State Council of Defense, the State Committee of Food Production and Conservation, the Extension Department of Purdue University, the county agricultural agents, the farm press and daily papers, the builders of various types of silos, hundreds of patriotic farmers, bankers and merchants are all directing united effort to accomplish in a single year what ordinarily would be considered the work of ten or more.

# CEMENT AND ENGINEERING NEWS

with which Gravel & Stone Magazine is incorporated

(PUBLISHED MONTHLY)

**WILLIAM SEAFERT, Editor and Publisher**

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CHICAGO, JULY, 1918


## The Housing Question

One of the most interesting subjects at the present time is the housing question, the problem of providing adequate rooming and boarding facilities for the host of workmen drawn toward new industrial centers that spring up like mushrooms in connection with the various branches of the war industries.

We have given this subject considerable space in past numbers of our magazine and will continue to do so in future issues.

The principal points confronting us are the following:

Since the beginning of the war the large industrial centers have experienced so much difficulty in getting and keeping employes that special attention had to be given to the employment situation. Numerous investigations proved that at many places inadequate housing accommodations were at the bottom of the sudden shifting of the working population to places where more comfort was available. In former years, when wages were low and when the supply of labor far exceeded the demand, the workmen had to put up with almost any kind of housing. Now the manufacturer has to bid for his services by putting up decent houses and by supplying sanitary working conditions.

The means of drawing a crowd of high-grade mechanics to new industrial establishments has thus been found. However, many companies are not in a position to offer the desired attractions as the present abnormal prices for labor and building materials have shut off the supply of houses. In former days, houses were supplied by speculative builders and real estate operators. But, at the prevailing high prices these had to discontinue business, and the manufacturer had to make up his mind to build in order to be able to hold his men, although he knew there would be no profit in it. In other words, a corporation desirous of having permanent high-grade help is forced to use part of its capital for conducting real estate business and to charge all losses against operating expenses. No longer can a manufacturer build a large plant and find houses springing up all around it without any effort on his part. Even in large cities the manufacturers themselves have to combine to raise the necessary capital to take care of and remedy the housing situation; and so it is that we find in city after city and in many rural communities industrial plants are putting out large sums of money in building model villages or model homes for their working people. Money spent in this way is well spent as larger returns can be expected on the remainder of the capital due to better work done by more contented workmen.

As important for a corporation as the question whether to build homes for its workmen or to leave this to others, is the problem of putting up the right kind of buildings. The less skilled workman must have a sanitary home as well as the more educated mechanic, but it is not necessary that his home be furnished with all the conveniences and appurtenances that are thought necessary in the home of the latter. In Philadelphia and Washington special skill has been displayed in solving the problem of housing the low-paid workmen in long rows of four-room houses with party walls.

In other places, different architectural taste prevails, and many interesting points relating to the lay-out of the houses, the material to be employed, the plumbing, bath room requirements and other sanitary devices have to be considered.

Besides providing room for families, lodging houses for single men and boarding places for them form an equally important phase of the housing problem.

## Government Establishes Division of Engineering

Government supervision of employment for technical men has been inaugurated by the United States Employment Service, through the establishment of a Division of Engineering with A. H. Krom of Chicago, formerly secretary of the American Association of Engineers, as director. Mr. Krom is a graduate of the School of Electrical Engineering, Purdue University, and for the past eight years has been actively engaged on utility development and promotional work. Recently he was engineer in charge of the Chicago office, State Public Utilities Commission of Illinois.

War demands on the engineering profession have already caused a serious shortage of men with mechanical designing experience and those with practical experience in chemical engineering. At present the professional organizing mediums reach less than 20 per cent of the estimated 300,000 technical men in the country. This is not a satisfactory arrangement for war times. All the technical men of the country must be reached and, in addition, all men with technical experience must be carefully registered so that they will be immediately available. The advantages of such a governmental registering and systematizing of employment will be apparent at once, to the engineer.

In consideration of the fact that this is principally an engineer's war, the importance of federal direction of proper distribution and conservation of the technical service of the country, is a very important matter. The Service will be started through the office of the Director of Engineering, 29 S. LaSalle St., Chicago. All technical men desiring to register for emergency government work or permanent advancement in positions meeting their qualifications, are urged to volunteer at once for registration, classification and employment.

# Application of Reinforced Concrete to Ship Construction

By Allen Hoar,* Civil Engineer, U. S. N. R., Mare Island, Cal.

The full practicability of using reinforced concrete as a material for shipbuilding is just commencing to be realized. When the writer first took up the study of the application of this material to ship work two years ago he met with considerable skepticism on the part of shipbuilders and shipping men, who maintained that the material could not be handled or designed so as to withstand the excessive bending and twisting moments experienced by a ship steaming in a heavy sea. A great deal of this opposition, which is always encountered by a new departure in any engineering problem, has been overcome by the absolute necessity of finding a new material for the construction of ships —a material in general abundance, relatively cheap in cost and affording rapid construction methods.

Concrete is a thoroughly reliable material for repair work about ships, and as such has been extensively and advantageously used in ships' bottoms for several years. By its use practically new hulls have been made out of old ones.

Success in using this material depends upon the proper use of metal bonding, wire-mesh, bars, rods, etc., and the efficiency of these connections to the old hull and frames. Concrete has in its favor cheapness, reliability and permanency; it can be applied at any place with tools that can be carried with ease and obtained in any port; no great skill is required in using it, and it becomes stronger with age, which cannot be said of any other material. There are no doubt many old vessels which could be saved from the scrap pile by a judicious use of this material.

Reinforced concrete may also be used for repair and replacement of beams, longitudinals, stringers, stiffeners, decks, columns and engine and boiler foundations, just as successfully as in hull work. The only requirements being that the members be designed by a competent engineer familiar with the behavior of concrete under stress and the strains encountered in ship work, and so connected to adjoining members as to transmit the required stresses.

*From Engineering and Contracting.

Many instances can be cited of vessels in commission depending upon the strength of concrete bottoms to keep them afloat. Concrete placed in the bottom of the hull is the greatest protection a ship may have when striking a submerged rock or grounding in a storm. Reinforced concrete has been successfully used in cases where the bottom plating of ships has become dangerously thin from corrosion, and an instance is known of one such case where the hull has long since been entirely worn through, yet the vessel is still in operation, depending entirely upon the concrete bottom. The concrete is placed 10 in. thick over the bottom and diminishes to 4 in. thick above the round of the bilges. It is tied to the original ship work by longitudinal reinforcing bars run through holes drilled in the frames.

Another instance is recorded of a schooner having a concrete bottom grounding on a sharp lava rock in a heavily beating sea near Honolulu. It is stated that a ship of ordinary construction could not have withstood the severe racking 24 hours without having been crumpled and ground to pieces, and it is claimed that the concrete bottom and the hull of this ship as far as the concrete extended remained intact for months, although the frames and outside planking elsewhere were broken and splintered and every other vestige of the ship torn to bits.

Upon stranding the first sign of weakness in a vessel is displayed by the crumpling up or piercing of her bottom and the ultimate straining and tearing asunder of her upper works when she breaks in two. Any material that can be placed to advantage to strengthen and stiffen this local weakness, and efficiently care for the enormous compression moment due to the longitudinal straining of the ship under these circumstances, is a supremely suitable material for this use. Reinforced concrete possesses these qualities and little mistake can be made in using it.

Cement and concrete have also been used to some advantage in wooden vessels to plug up and stop the boring of marine animal life and to patch up and pro-

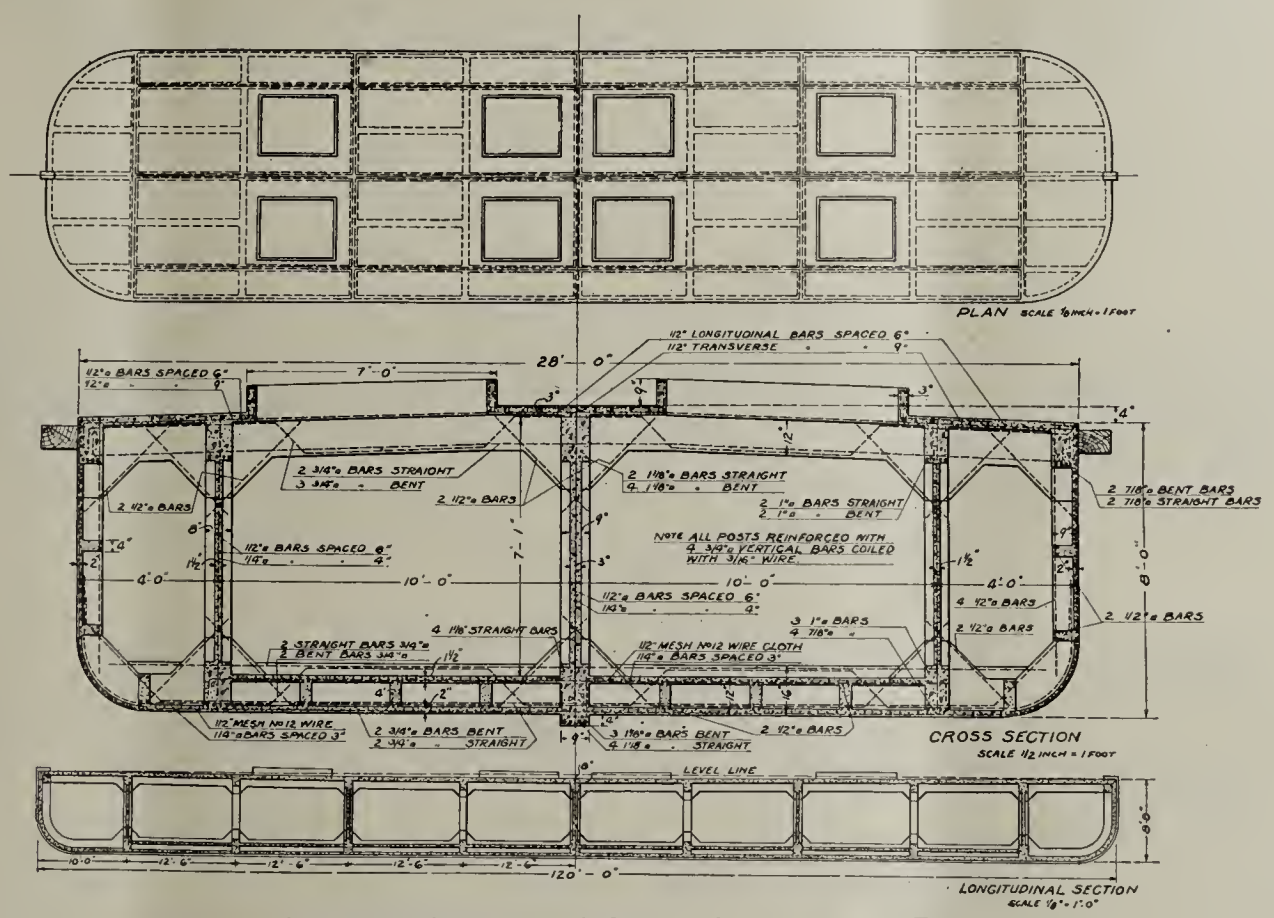
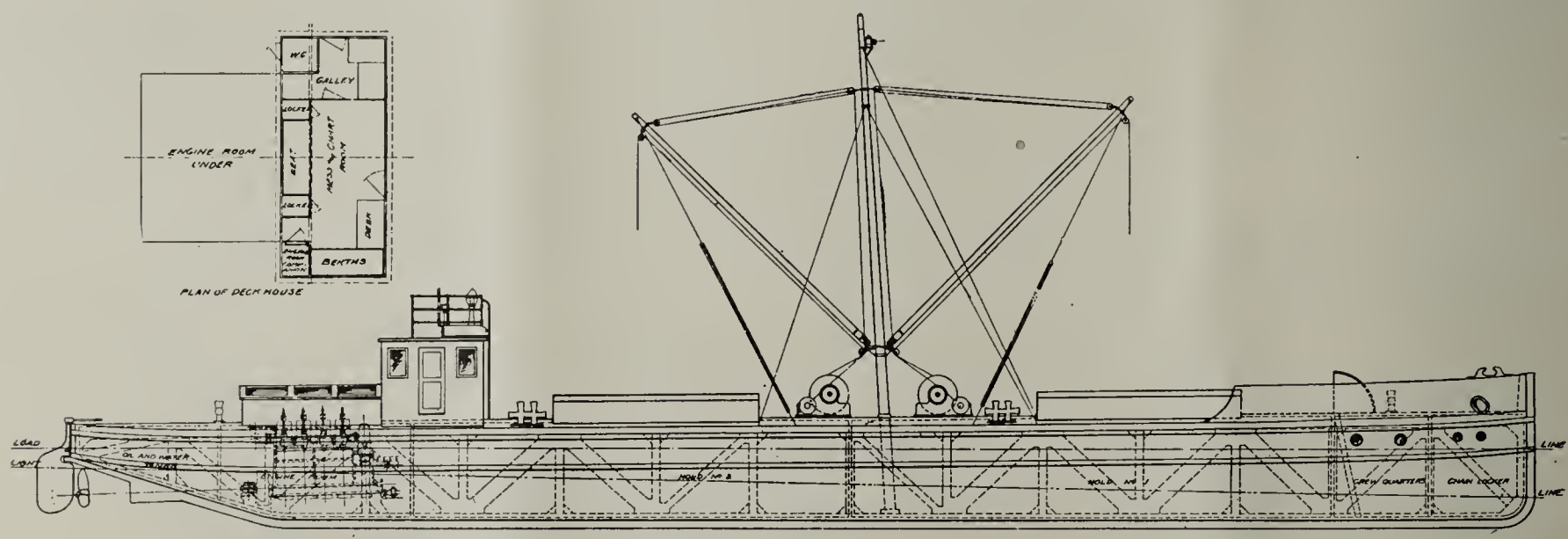



Fig. 1—Design for Reinforced Concrete Salt Barge.

tect decayed timbers. It has a use for almost every possible phase of ship repair work.

Concrete as a material for ship construction is not new, although today its general use for this purpose is looked upon with the same degree of skepticism that steel was but a very few years ago. The employment of reinforced concrete in the construction of vessels may be truthfully said to date back to the time of the early Egyptians. Here boats were built of clay and reed, and used on the Nile several hundred years ago. These boats were built of a natural clay or cement plastered over a framework of reeds for reinforcement. The principles of construction used were practically the same as those used on many types of vessels that have lately been built, except that now steel is used instead of reed and Portland cement concrete instead of a natural cement.

Since this time many experiments have been made



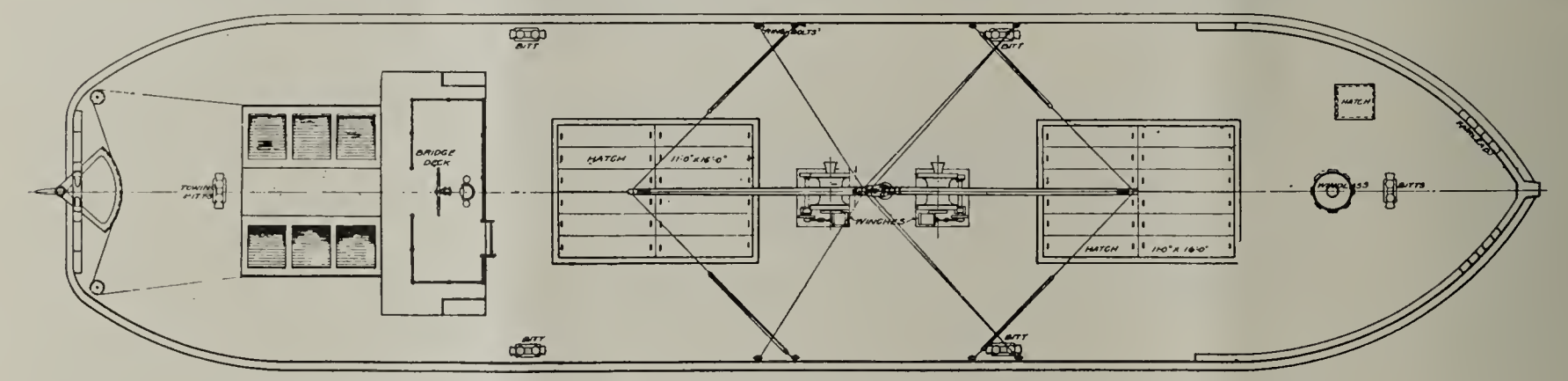




Fig. 2—Profile and Deck Plan of 250-Ton Capacity Reinforced Concrete Motor Barge.

and much progress accomplished in the use of reinforced concrete for the construction of floating bodies. In the last few years, particularly, there have been many and various types of reinforced concrete vessels constructed. These have included floating caissons for foundation work, pontoons for various purposes, floating dry docks, pleasure craft, light-towed and self-propelled vessels—and car ferries. Although up to the present time no large ocean-going steamships of this material have been put in commission, freight lighters having a full load displacement of 3,000 tons or more have been built, and this is but indicative of what can be done as a substantial evidence of the practicability of reinforced concrete for use in shipbuilding.

The physical properties of reinforced concrete and its behavior under stress are well known and have been reliably determined by test and practical experience. Rational and positive methods for computing the strength have been evolved, so that now absolute dependence can be placed upon it. It is a material in which its internal resisting properties can be so distributed as to best react against the external forces —the steel, where it all acts to resist tension, and the concrete, where it will supply the necessary resistance in compression to establish equilibrium.

With the proper exercise of ordinary skill in the design and construction there is no more liability of a reinforced concrete ship to fail under the extreme and alternating bending stresses to which a ship is subjected when riding on the crest of a wave and then in the hollow than there is for a steel ship. In fact, there will be experienced only a very small percentage of the deflection of a steel ship, and consequently considerably less local strain.

That a ship of reinforced concrete can be built to safely withstand these stresses and yet compare favorably with a steel ship as far as weight is concerned may be clearly realized after giving due consideration to the characteristics of these two structures. The resistance of a steel ship to longitudinal bending is limited to the strength and efficiency of its riveted joints and connections, which are extremely susceptible to "working" under the alternate loading imposed, and therefore the true strength of the ship is in the shear of its rivets and rivet holes, but a small percentage of the tensile strength of the steel through any section. In fact, careful and conservative calculation has shown that a reinforced concrete cargo vessel need be only 6 per cent heavier than a steel ship and much lighter than a wooden ship.

All the shear occurring in the structure may be taken up by direct tension in the steel, thus utilizing the reinforcing of a concrete ship in the best possible manner. There are no rivets to work loose and accentuate the deflection and resultant strains as in a steel vessel. The coefficient of bond between concrete and steel has been determined within safe limits, and with proper detailing there need be no danger of slippage.

Concrete expands and contracts with changes of temperature. Its coefficient of expansion—that is, its expansion per unit length per degree rise in temperature—is almost identical with that of steel, and on this account there is no tendency of the two materials

to pull apart, and they act together under all conditions. In such a structure as a ship, free to expand or contract in all directions, there need be no special provision made to care for this, as is necessary in a large bridge, building or dam.

A reinforced concrete ship is monolithic throughout, just as if it had been carved out of a solid block. The frames, beams, girders and stringers are continuous from side to side and from end to end of the ship, while even the hull and decks form part of the members, as are the columns, the entire structure being tied together by the reinforcing steel.

This solidity and entire lack of joints especially adapts reinforced concrete to varying and alternate loading and to heavy and high-speed machinery. The vibrations are deadened and absorbed in a way which is impossible in steel structures.

Steel rods are set in the concrete to provide for

## Change in Fineness Requirement

The departmental conference on United States Government specifications for Portland cement has adopted the following resolution relating to the date of effect of the fineness requirement in the United States Government specification:

> "Resolved, That the requirement for fineness of cement in the present specification, which is as follows: 'The United States Government specification requires that on and after July 1, 1918, the residue on the 200-mesh sieve shall not exceed 20 per cent by weight,' be changed to take effect six (6) months after the close of the war with Germany instead of July 1, 1918."

This resolution has been approved by the heads of the several Government departments and therefore becomes automatically effective July 1, 1918.

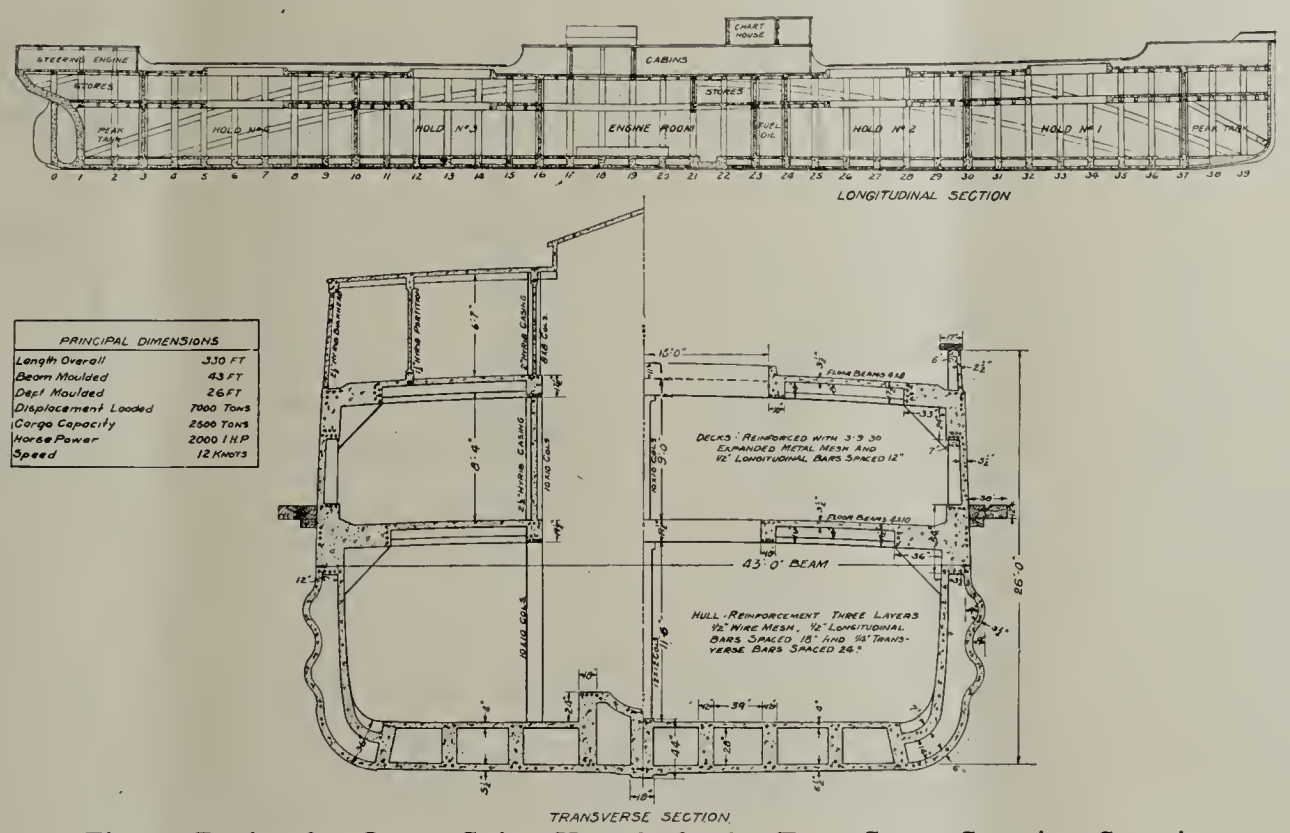



Fig. 3—Design for Ocean-Going Vessel of 3,500 Tons Cargo Carrying Capacity.

tension in such amount and where needed for any special loading for which it may be designed. Consequently, spans can be constructed of any reasonable length and column spacing may be adapted to the requirements of the situation.

The successful application of the use of reinforced concrete to ship construction entails simply a thorough knowledge of the theory of design of reinforced concrete, experience with the principles of construction, vigilant inspection and honest workmanship. The concrete must be of the best, a rich, well graded mix with careful selection and grading of the sand to secure a thoroughly dense impervious product. As a further precaution all steel used in the shell should be galvanized to prevent any chance of injury to the concrete by corrosion of the metal and the consequent spalling off or bursting of the thin cement covering by the swelling of corroding metal.

Examples of designs for reinforced concrete vessels prepared by the writer are shown by Figs. 1, 2 and 3. Figure 1 is a design for one of a fleet of barges for use on inland waters to operate with a tug boat. Figure 2 is a design for a self-propelled coast wise lighter of 250 tons dead weight carrying capacity propelled by 150-HP. Diesel engine at a speed of 9 knots. Figure 3 is a design for an ocean-going cargo and passenger vessel having a cargo carrying capacity of 3,500 tons dead weight and a speed of 14 knots.

## 1,480 Rivets in Four Hours

Peerless No. 4810 Air Hose was used in a remarkable record at driving rivets made under handicap at the Morse Dry Dock and Repair Company's plant in South Brooklyn recently.

Bertram Bieher, riveter, and his holder-on, Eddie Hesse, with four heater boys, drove 1480 regulation size three-quarter inch button-head rivets in four hours and ten minutes.

As the men were forced to travel 34 feet for every 18 rivets driven and worked on girdons on which the rivets were 12 inches apart, the conditions were considered unusually trying in shipbuilding plant circles. Despite the handicap the men worked faster each hour until 10 minutes before completing the job.

| | | | | | |
|---|---|---|---|---|---|
| 352 | rivets | were | driven | the | first hour. |
| 360 | " | " | " | " | second hour. |
| 361 | " | " | " | " | third hour. |
| 362 | " | " | " | " | fourth hour. |
| 45 | " | " | " | " | last ten minutes. |

For a record of this kind, it is obvious that air hose plays an important part in rivet driving. It would not do to have to stop to make repairs.

Four thousand eight hundred and ten Air Hose, made by the United States Rubber Company, is a well-constructed hose that will not kink and is non-leakable and impervious to the action of oil.

# The Range of Results Obtainable in the Use of Concrete in Water Tank Construction

By C. C. Whitaker, Consulting Engineer, Forsythe Bldg., Atlanta, Ga.

The application of reinforced concrete to artistic architectural work is not new; in fact, the history of Ferro or reinforced concrete seems to indicate that its first use was the construction of an ornamental flower pot or urn, which, when further considered, amounted to simply a small tank.

### Possibilities of Concrete in Tank Construction

It is the purpose of this article to show from the standpoint of tank construction what has been accomplished in this type of structure by the utilization of concrete, and the vast possibilities that exist in this material when rightly used.

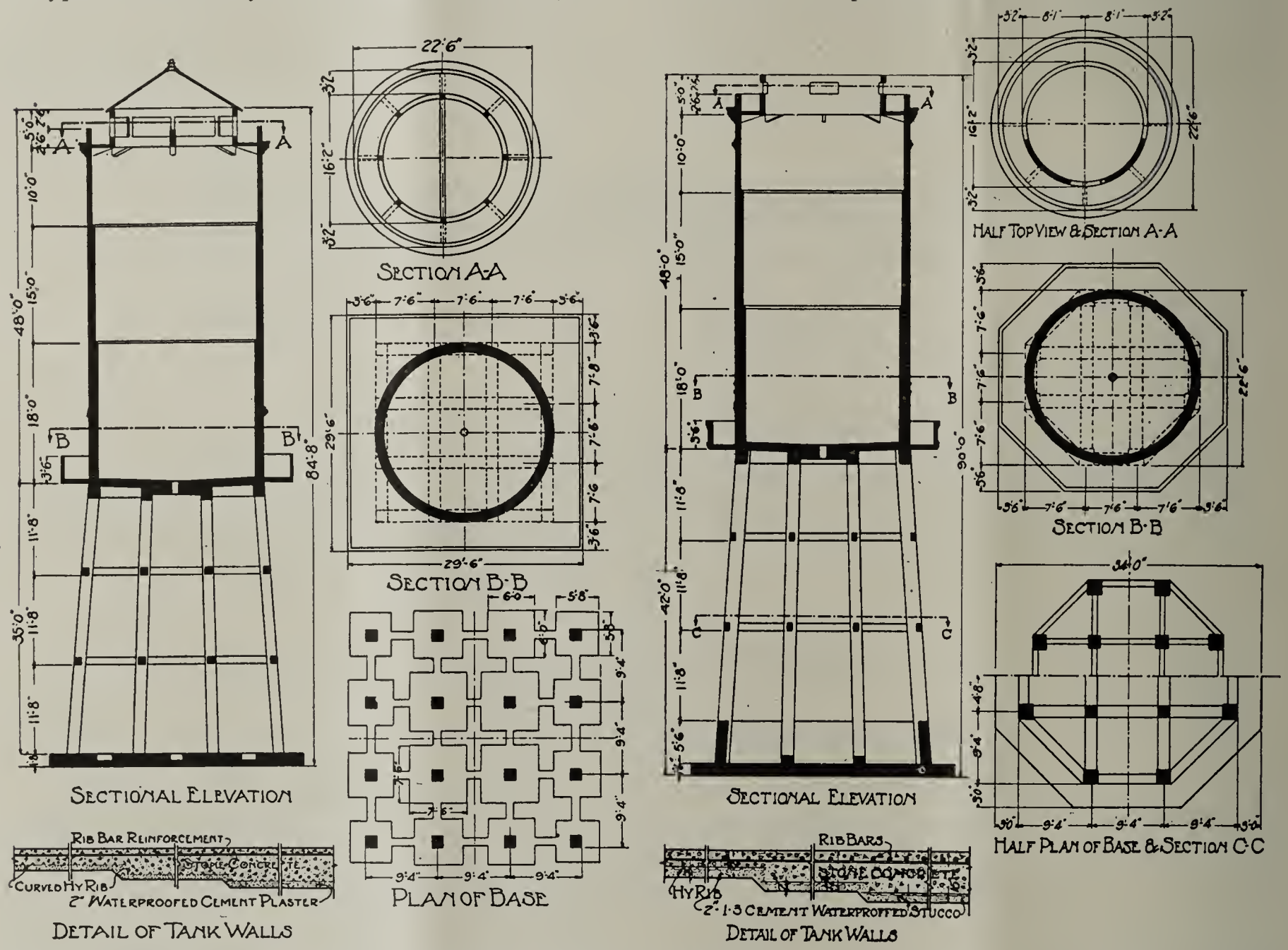
From time to time very interesting accounts of reservoir or tank construction in reinforced concrete have appeared in a great number of publications, and different parts of the work have been featured to a more or less extent.

### Common Types

The actual designing methods used in all work of this kind vary, though in general they amount to simply the utilization of long-accepted theories applied to a new condition. It is not the purpose of this article to deal to any great extent with the technical features of tank or standpipe design, or methods of construction.

The architectural details that can be accomplished are so vast in their number and types that it is simply a case of the ingenuity or artistic talent of the designer.

There are very few that have not seen the ordinary, every-day standpipe and tank tower of concrete holding either a tank of concrete or some other type of material. Some years ago, and not so many at that, a structure of this kind was looked upon as a novelty. Those of us, however, that were keeping abreast of the times not only saw the stability and far-reaching effect of concrete for uses of this kind, but realized without question that for this type of work concrete had come to stay, and still further, that its possibilities were unlimited.




Reinforced Concrete Water Tanks Nos. 1 and 2 at Alton Beach, Miami, Florida. Each Tank of 100,000 Gallons Capacity. Kahn System of Reinforcement Used.

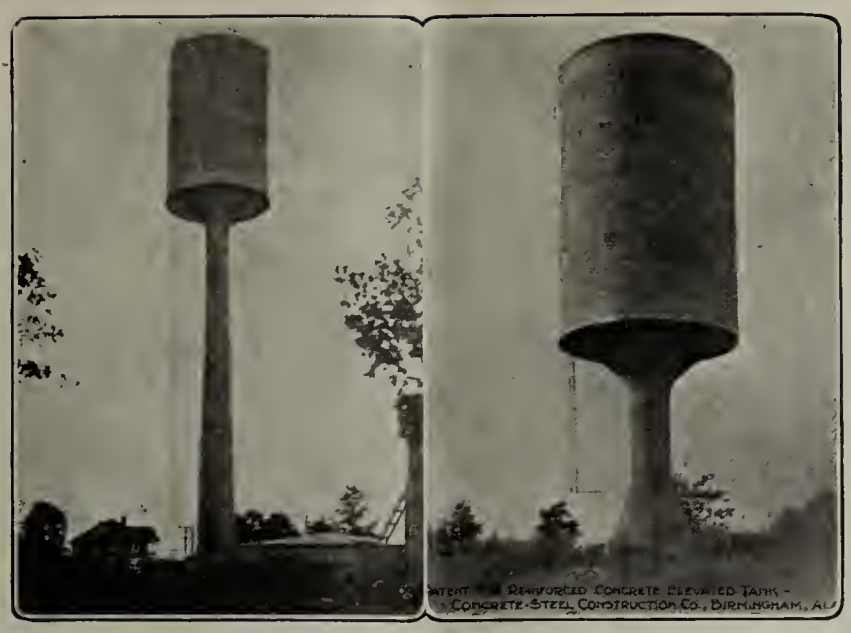
An ordinary square leg or otherwise straight-leg tower or bent construction is one that needs no comment. We, therefore, pass this type of construction for one that is going to seem like a very daring design.

### Novel Tanks at Bay Minette and Northport, Ala.

By referring to the cuts herewith of tanks at Bay Minette and Northport, Ala., and the details of the former, it will be noted that by enlarging on an ancient kind of water receptacle a very novel as well as stable and pleasing type of reservoir design has been accomplished. These tanks are known as goblet tanks, owing to their likeness to the drinking vessel of the same name. By referring to the reproduction of details it will be very easily seen that what at the first glance appears to be a very daring design is far from such and by the use of standard practice and accepted theory has reduced itself down to simplicity itself.

The tank at Bay Minette is 80 feet from ground to tank bottom, and that at Northport 30 feet from ground to

* Written for Municipal Engineering.




**View of Reinforced Concrete Water Tanks of Goblet Type at Bay Minette and Northport, Ala.**

tank. Both tanks are 30 feet in depth and of 80,000 gallons' capacity. The overall heights are 110 feet and 60 feet respectively.

### Use of Hy-Rib in Bay Minette and Northport Tanks

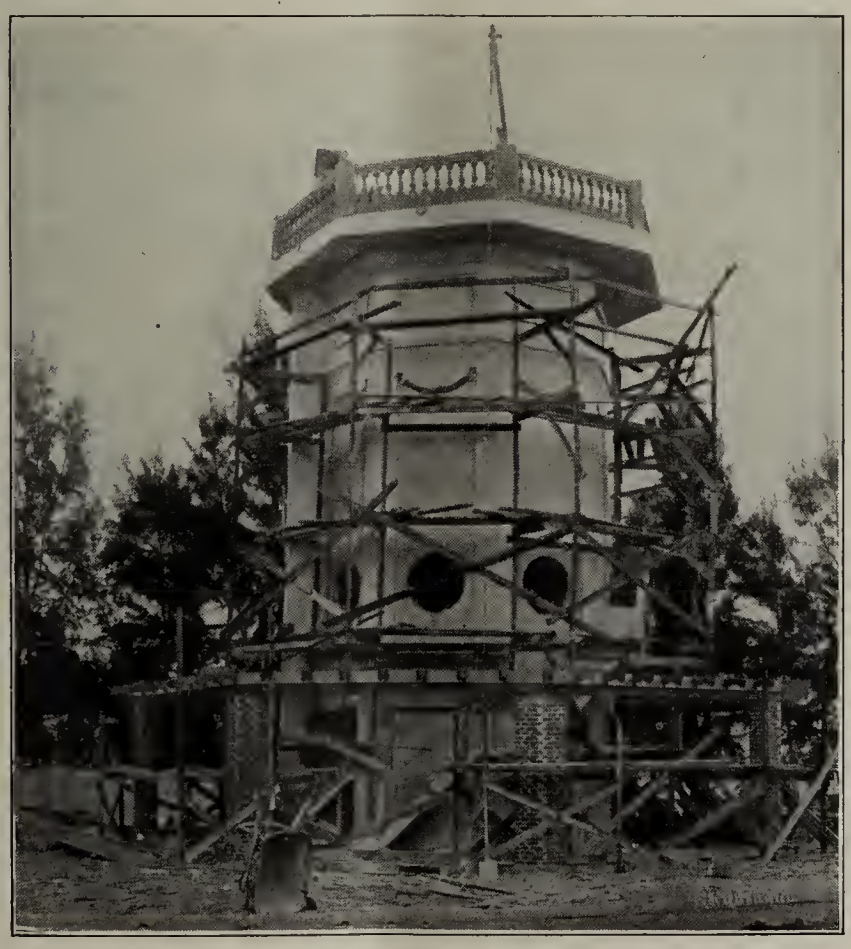
The barrel of the Bay Minette (Ala.) tank was formed by the use of two lines of curved Hy-Rib (one inside and one outside) the Hy-Rib acting as a permanent form and at the same time a part of the reinforcement. The inner line of barrel of curved Hy-Rib was waterproofed cement stucco, using the integral method, with Trus-Con Waterproofing Paste. This was allowed to set up, thereby performing two duties in the construction, one being the waterproofing of the inner face and the other the permanent closed form. When it is taken into consideration that this tank stands 110 feet above the ground the advisability of this method of forming can very easily be appreciated. When water was turned into the tanks at full pressure there were no signs of leakage.

In the forming of the barrel of the Northport (Ala.) tank, which is considerably lower than the Bay Minette tank, it was found advisable to use only the curved Hy-Rib for the inner form, which was treated the same way as the Bay Minette tank, and to use metal forms for the outside.

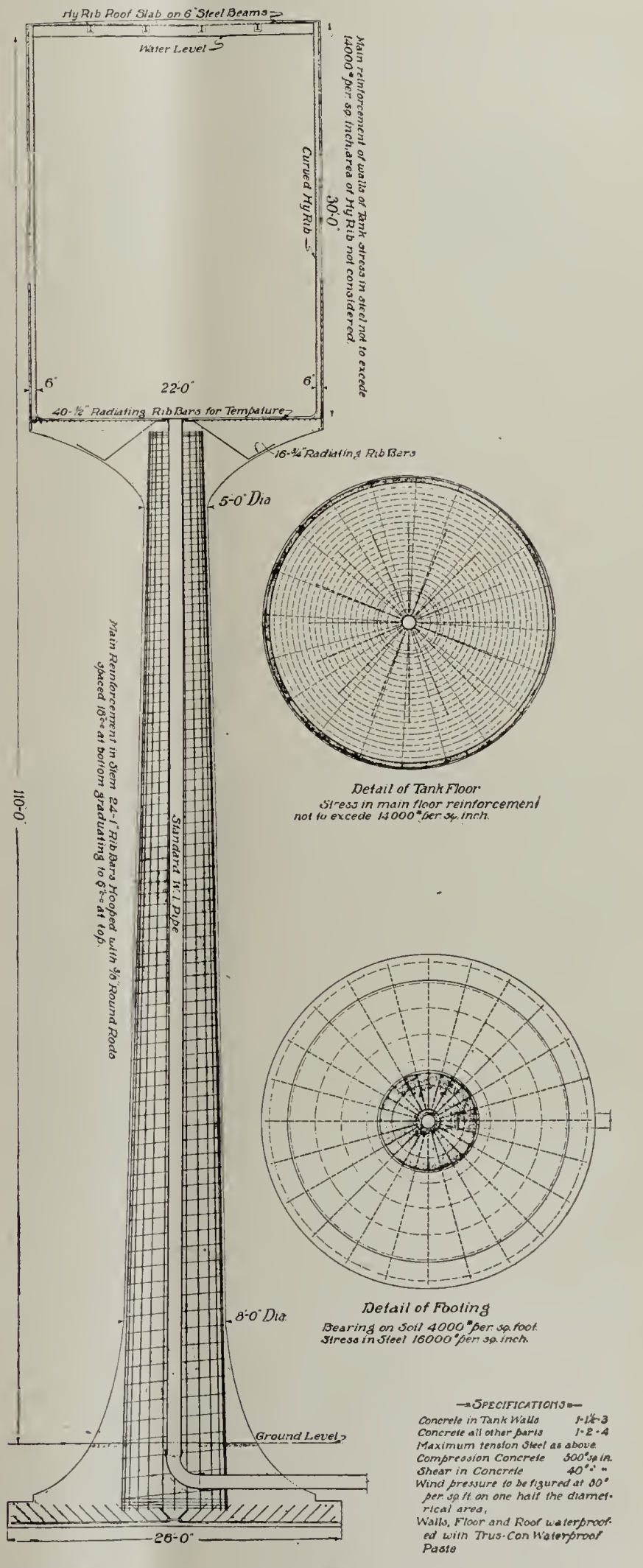
### Severe Test of Stability of Bay Minette Tank

About the middle of June, 1916, one of the most severe storms that has ever visited the Gulf Coast section of the country swept over Bay Minette, Mobile and Northport. During this storm, according to the Weather Bureau reports, the wind reached a velocity of more than 80 miles an hour.

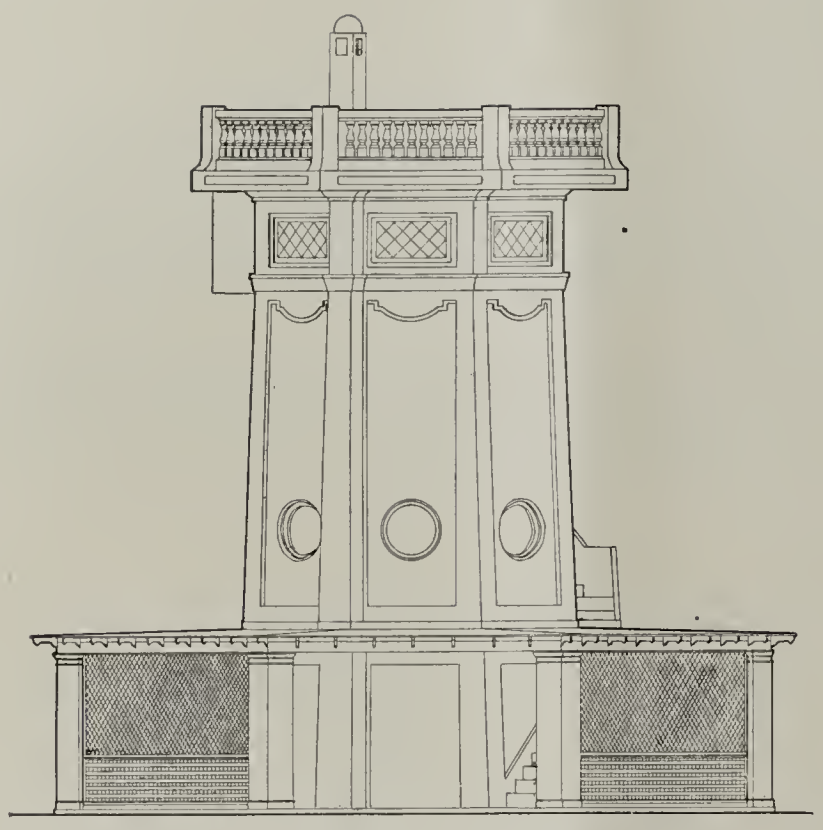
The Bay Minette tank was, comparatively speaking, green as it had then only been completed a short time. In



**Construction View of Eastwood Reinforced Concrete Observatory and Water Tank Tower at Miami, Fla.**




**Details of Design of Reinforced Concrete Tank of Goblet Type at Bay Minette, Fla.**



Architect's Drawing of Eastwood Reinforced Concrete Observatory and Water Tank Tower at Miami, Fla.

the town proper of Bay Minette a great many residences and other buildings were unroofed. Quite a number of structures were completely demolished and a vast amount of other damage done by the wind. The correctness of the assumptions of this design has without doubt been proven as both of these tanks are now standing and show no signs of any weakness due to the tremendous pressure put upon them.

As a further demonstration of the stability of this type of structural design; these tanks were in no way guyed or stayed to the ground and relied entirely on the stem for the transmission of the pressure into the footings, which in turn must have been correctly designed against overturning.

### Architectural Possibilities in Use of Concrete

As a matter of interest, it may be well to mention that both of these tanks were awarded in direct competition against steel tanks on steel towers and that in both cases there was a saving in first cost realized.

There is nothing architecturally beautiful about these structures, but the oddity of the design lends interest to the general condition and makes possible a tremendous saving in room space, thereby recommending the general adoption of this type of structure for commercial or manufacturing water supplies.

The patents of the design for these goblet tanks are owned by the Concrete Steel Construction Company of Birmingham, Ala., Mr. L. H. White, president and chief engineer. The tanks shown were constructed by them.

There is no reason why, with the architectural possibilities in concrete work, that tanks or water supply systems in large and beautiful estates should not be made one of the most beautiful parts of the general scheme of improvement, rather than an eyesore; as has been the case for a number of years and will almost always be the case in the old, antiquated type of either stave tanks on pipe bents or steel tanks on the same or kindred type of towers.

### The Alton Beach Tank at Miami, Fla.

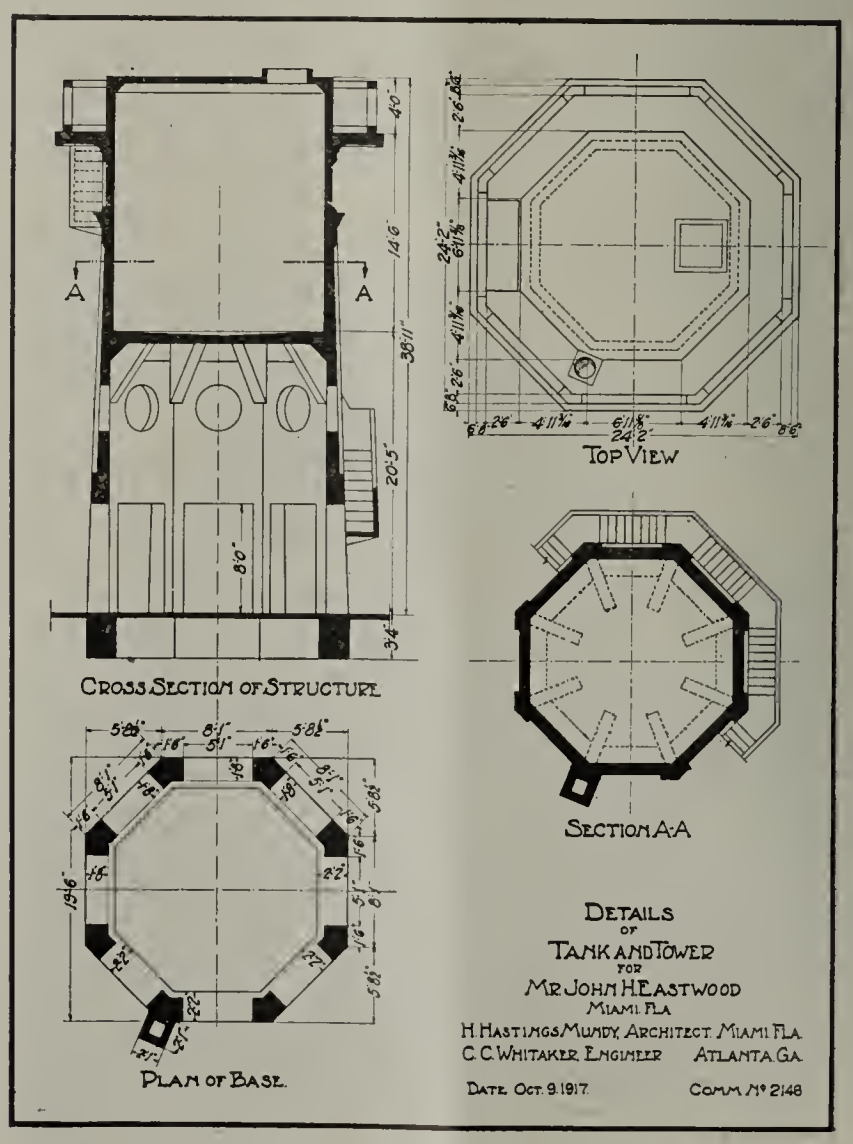
One of the first sections to realize the necessity for departing from the old type of structure was Miami, Fla., on the Carl Fisher Estate improvements, Alton Beach. In this development are located private residences and home estates in which the general type of structure has run in actual cost of production from $20,000 to untold thousands, and no money, in a great many cases, has been spared to make them not only most modern, but as beautiful architecturally as possible.

The water supply system, which had been taken care of largely by small pumping stations and private wells, resolved itself down, from the fire protection standpoint if nothing else, to a large central supply. As the general topographical layout of the ground is perfectly flat, having an altitude of only about 9 to 12 feet above high

View Showing Detail Around the Balcony of the Reinforced Concrete Water Tank on Carl Fisher's Estates, Alton Beach, Miami, Fla.

water, it will very readily be seen that tower construction had to be adopted for even pressure, or the maintenance of a very expensive and sometimes undependable pump system.

It was, therefore, decided to construct an elevated standpipe or reservoir. Bids were taken on a steel tower and steel standpipe. This at the best would never have




Eastwood Reinforced Concrete Tower and Tank at Miami, Fla.

View of 100,000-Gallon Reinforced Concrete Water Tank at Alton Beach, Miami, Fla.

been anything except a standpipe, allowing but limited chance of beautification, and would always have been a constant eyesore to this community, particularly so on account of its being the tallest object on the sky line and, therefore, the most noticeable. It was, therefore, thought advisable to take bids on concrete construction with the final result that this class of material was adopted.

Through the able management of the gentleman intrusted with this work, Mr. August Geiger, architect, of Miami, Fla., and the co-operation of Mr. John B. Orr, plasterer, a very pleasing architectural result was obtained. It may be worth mentioning that a saving, though slight, in cost was effected by the use of a reinforced concrete tower, curtain walls in terra cotta tile and a reinforced concrete tank.

### Application of Hy-Rib in Alton Beach Tank

The interior barrel of this tank was laid out in a curved Hy-Rib, which was placed from the base up to nearly the offset line of the different thicknesses of the tank and which ultimately acted as the interior forms of the tank.

This Hy-Rib barrel was built in three courses of waterproofed cement stucco, considering the barrel as separate and distinct from the structural walls of the tank, reinforcing this not only with the Hy-Rib in the horizontal direction, but vertically with pencil rods against any possible expansion or contraction. This permitted of carrying the waterproofing in the floor of the tank up in a positive unbroken line from the bottom of the tank to the top, as each course of stucco or plaster work was laid in such manner as to prevent there being a lap or joint coming over the same point in any two courses. In other words, at no place on the inner surface of this tank is there less than two unbroken courses in thickness of cement waterproofed stucco.

The gauge of Hy-Rib was varied from a 22 to a 26, each division having been reduced toward the top, starting at 22, 24 and 26 in the top line.

By referring to illustrations of the tank at Alton Beach it will be noticed that this tank or reservoir has been turned into probably one of the most beautiful pieces of architectural construction on the island. The finish is of stucco. Some parts of this work have been accomplished by precasting the ornamentation; other parts by run moulds with the base or background in a rough cast stucco work. The color scheme adopted of fawn background with lighter moulds and white base and door frame adds greatly to its beauty.

A great deal of credit is due Mr. Orr, who is an artist in more ways than one in the use of stucco and ornamental plaster work, as his co-operation with Mr. Geiger made it possible to produce a structure which from a standpoint of beauty possibly is not surpassed by any structure of its kind in existence.

This was the first of this type of structure constructed and has proven so satisfactory in every respect that, with minor changes, a second tank of the same type is now nearing completion.

### The Eastwood Tank at Miami, Fla.

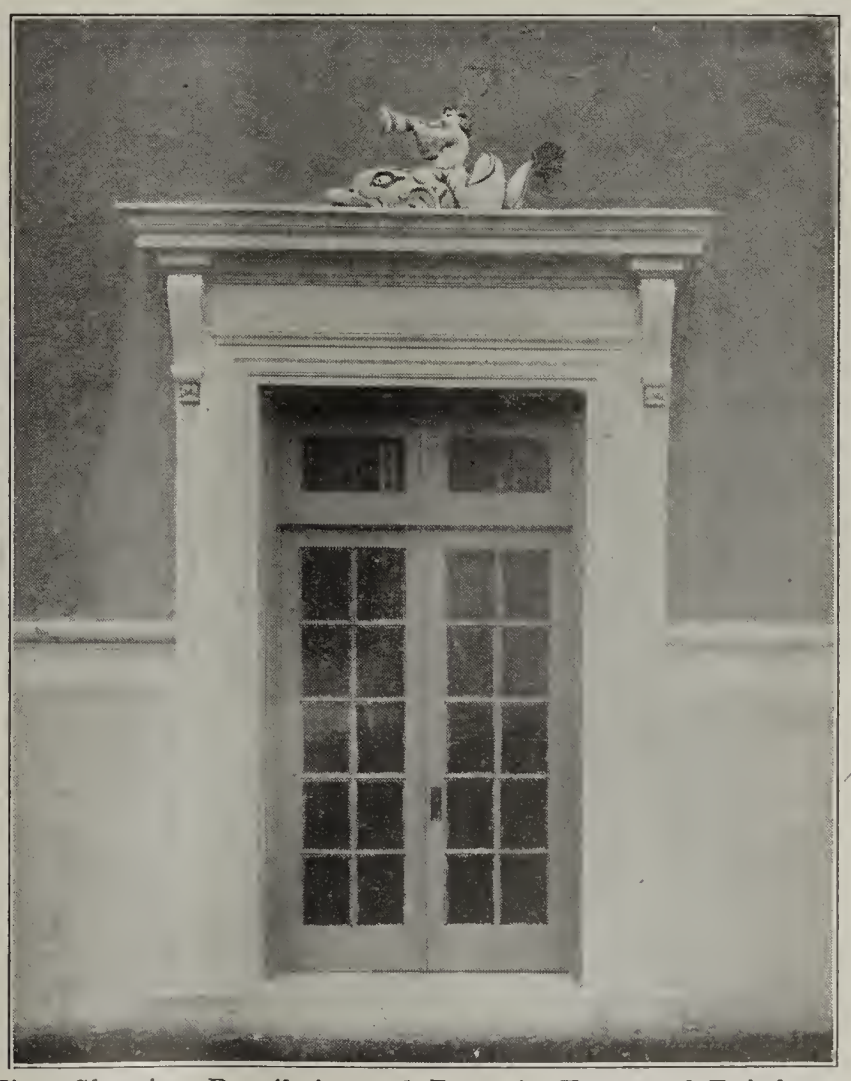
Another type of ornamental tank or reservoir that shows still further the possibilities of reinforced concrete in this class of work is the reservoir or house supply tank designed by Mr. H. Hastings Mundy, architect, also of Miami, for Mr. John H. Eastwood's estate in that city. A construction view of this structure is shown herewith, and, in the hope of showing still further the elasticity of this kind of designing work, a reproduction of the architect's detail has been used.

This structure will serve several purposes. Primarily it is the source of water supply for the entire building equipment for the estate; it is also an observatory or lookout and at the ground level can be used as a garage or for many other purposes.

The general architectural appearance of this structure will be very pleasing, most particularly as it harmonizes with and is of the same general architectural type as the remainder of the structures of the estate.

### Water-Proofing Concrete Tanks

It may be of interest to mention that the water-proofing of all of these structures has been of an integral nature, either throughout the entire mass of concrete in the



View Showing Detail Around Door in Tower of Reinforced Concrete Water Tank, Miami, Fla.—Note Stucco Finish.

walls and floor of the tank or by the construction of an inner water-proofed stucco shell on curved Hy-Rib lath. In all cases this type of water-proofing of the tank barrel has proven satisfactory and has allowed of a marked saving in time and first cost. The adverse condition that nearly always prevails due to the use of any type of membrane inner coating was eliminated by the integral water-proofing. All materials now on the market of a membrane nature applicable for this purpose are either a composition of coal tar and mineral oils to which in a very large number of cases a creosote compound is added, or a material to which is added other chemicals, as a usual thing of a mineral nature. Any one of these compounds is bound to taint the water more or less, particularly if they are used simply as a membrane and not protected on the inner face by a stucco, which should be integrally water-proofed, thereby preventing the pollution of the water contained in the tank. Too much attention cannot be given to this feature of the construction as the entire success of the venture or problem depends on this part of the design, specifications and workmanship.

It has been the purpose of this article to bring to the attention of the many readers of this paper not only the advisability of tank construction in reinforced concrete, but to show the wide range of results that can be obtained by its use.

There are so many points of advantage in the use of this material for this purpose that it hardly seems necessary to go over them. A word of caution, however, may not be amiss—do not think that because a contractor can construct a concrete wall he can necessarily construct a concrete tank, for often this is not the case. One cannot take too many precautions, both in the design and the construction of work of this nature, to insure a satisfactory structure.

## Manufacturing Burial Vaults

The manufacture of Automatic concrete sealing vaults is now in full swing at the plant of the Eau Claire Concrete Company, Eau Claire, Wis. The first vault was completed at the Main Street factory yesterday. It is expected by the management that they will be able to complete two of these vaults each week. After they are finished they are left in the forms (furnished by the Automatic Sealing Vault Co., 216 East

**Cement Products Plant of Chas. F. Culp, New Rockford, N. D. Notice the large stock of Automatic Concrete Sealing Burial Vaults.**

River street, Peru, Ind.) for three days and then the forms are removed and the concrete is given four days to dry. The vault is made of waterproof cement and is reinforced with strap iron. At burial the vault is lowered in the grave and at interment the casket is then placed within the vault. After this the cover is placed on the vault and by an automatic process fastens itself securely over the vault proper. This makes the vault air tight and water proof.

## Big Blast at Bath Cement Company Quarry

Government demands for cement are said to have been largely responsible for a big blast at the quarry of the Bath Portland Cement Company, Bath, Pa., May 16. It is said to be the largest blast in the history of the cement industry. Louis Rafetto, of Philadel-

**One Big Face Blast. Breaking up the Rock for Easier Handling. Cuts Down the Cost of Powder Per Ton of Rock; Stops Your Shovel and Crew Once—Not a Half Dozen Times (as by Bench Shots) and Reduces the Liability of Damage and Accidents.**

phia, vice-president of the company, pressed a button at the quarry that started the explosion.

The blast was placed under the supervision of superintendent F. B. Franks and was loaded in 105-foot well drill holes (Cyclone drills used) along a 600-foot face.

Atlas powder was used and 125,000 tons of rock is estimated to have been dislodged. Although the shock of the explosion was felt for a distance of several miles, no serious damage was done.

For safety and efficiency, the explosive charges were detonated with Cordeau-Bickford detonating fuse. For blasting the complete and proper detonation of the explosive by means of Cordeau-Bickford adds from 10% to 20% to the efficiency of the explosive. The number of pounds of stone blasted per pound of powder is materially increased. The increased shattering effect produced, results in smaller stone, less mud-capping or block holing, and reduced crushing costs. Added to these advantages is the one of safety. Cordeau-Bickford is insensitive to shock or friction. The elimination of accidents alone, is a feature which makes Cordeau-Bickford a necessity to the far-sighted quarry owner.

## Contractors Cut Haulage Cost with Semi-Trailers

"A large number of contractors, lumber dealers, oil operators and business men in various other lines of industry throughout the United States have minimized their haulage costs by using their motor trucks to haul loads instead of to carry them," says H. C. Fruehauf, general manager of the Fruehauf Trailer Company of Detroit.

"They have found that while the frame, springs, wheels and axles of a 2-ton truck could carry only two tons, the engine and driving mechanism were equal to a draw-bar pull of six tons or more.

"We have compiled cost figures which show that by using semi-trailers in connection with their trucks they have reduced their haulage costs from .2002 to .0808 per ton-mile—based on 2-ton trucks.

"Then, too, the investment in trailers and trucks is much less than that for trucks alone. A Fruehauf 6-ton semi-trailer costs just about one-third that of a 2-ton truck. In other words, you can increase the load per truck per trip 300 per cent by increasing the initial investment only about 33 1-3 per cent."

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## Instructions for Using the Macon Concrete Paving Roller

Laboratory tests show that the strength of concrete is decreased if too much water is used in mixing, and with the sloppy mix sometimes used in road work two-thirds to three-fourths of the possible strength is lost.

However, it is necessary on concrete road work to use a larger amount of water than that which will produce the highest strength, in order to facilitate proper handling of the concrete. It is very necessary, therefore, that on such work this excess water be removed as soon as possible after the concrete is placed.

The first records of the use of a roller are found in Ransome catalogs. Those issued in 1906 show a roller which had been used on work in Milwaukee in the early 90's.

The roller was primarily developed to consolidate and smooth the concrete, and one of the great advantages to be gained by the use of the roller on concrete pavements, where the roller is moved transversely over the pavement, is to remove any unevenness that may have been caused by the strikeboard so that the waves or inequalities that may remain have their axis lengthwise with the road and therefore cause no inconvenience to traffic; but the greatest advantage from the use of the roller is the increased strength which is imparted to the concrete because of the removal of excess water.

Laboratory tests on full thickness slabs, the results of which were reported in the 1917 Proceedings of the American Society for Testing Materials, show that the rolled slab was 20 per cent stronger than that finished by the ordinary hand float method alone.

The facility with which the roller may be used by even unskilled workmen has made every contractor who has used it loud in its praise. The roller method of finishing concrete is now incorporated in the specifications for road and street work by a number of State Highway Departments and municipalities.

The standard roller, 10 inches in diameter and 6 feet long, weighing approximately 1 pound per linear inch, is now manufactured in Dunellen, N. J.

The following directions for its use should be observed:

After the concrete has been struck with a templet the roller is to be used just as soon as may be without

Roller with Long Handle.

displacing the concrete. In warm weather, especially with rock aggregate if the concrete has not been mixed too wet, the roller may be used immediately. In gravel concrete it may be necessary to wait for ten or fifteen minutes. In cool weather it may be necessary to delay the first use of the roller for thirty or forty minutes.

If the pavement is not over 20 feet wide the roller may be operated from one side of the road to the other

Excess Water Being Brushed Along Curb.

by a long handle. If the pavement is much wider than 20 feet it will be found more convenient to attach a rope to the roller and pull it from one side of the pavement to the other, discarding the handle entirely. In this way it is possible to roll with the greatest facility any width of pavement. The roller is always to be moved transversely across the road at a small angle so

A Rope Attached to Rollers. Pulled from One Side of the Pavement to the Other.

that it will move lengthwise of the road about 2 feet each trip across.

After the first rolling the same area should be gone over again in fifteen or twenty minutes. The concrete should receive successive rollings at intervals of fifteen or twenty minutes, until little or no free water is squeezed from the surface. This usually requires not less than three rollings and frequently four or five, depending upon the amount of water with which concrete has been mixed and also on the temperature. The less the amount of water and the warmer the weather the fewer the number of rollings required.

If integral curbs are being built, the water removed by the roller will find its way to the gutter line, and if not brushed off on to the sub-grade will greatly hinder the curb work, as the water contains more or less silt and laitance, which will form a deposit along the gutter. The best method of removing this water is to use an ordinary street broom, brushing the water along the gutter and on to the sub-grade.

Immediately after the last rolling, the pavement should be finished with belts. Preferably two belts should be used, the first one six to eight inches wide, for which the stroke should be at least 12 inches and the forward movement very slight. This results in a perfect crown and eliminates all flat spots and longitudinal waves. As soon as the water glaze or sheen disappears, the pavement should be gone over with the second belt, which should not be more than eight inches wide. The stroke for this should be much shorter than that used for the first belt, and the forward movement should be correspondingly increased.

The final result of finishing a pavement in this manner is a dense, compact slab with a true, even, gritty surface, offering the best hold for traffic of all kinds.

## Use Concrete Bases and Cantilever Side Forms in Casting House Slabs

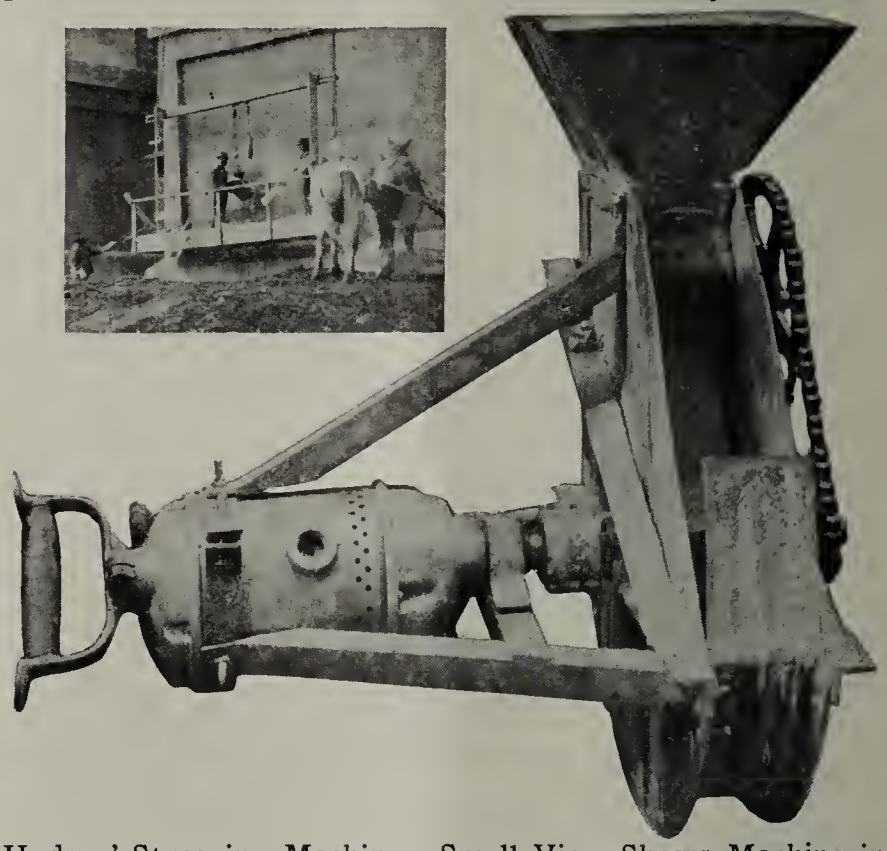
Concrete bases coated with paraffin and oiled after each use materially assist accurate work in casting the slabs for the concrete workmen's houses which are being built by the Unit Construction Co. for the Youngstown Sheet & Tube Co. The slabs, of which 150 are used in making sections for two of the three types of houses, are employed for casting the larger sections. They are poured directly on the ground. Each is made the exact size of the sections to be cast on it, is carefully floated level and finished smooth by troweling. In the sides of each a short distance from the top are embedded ¾-inch bolts and registering with the center of each stub bolt there is a slot in the wood side forms. Once slipped over these bolts, adjusted so their tops are level with the top of the slab to be cast, and clamped, these side forms are rigidly held by the bolts, no other bracing being required. The concrete beds, which cannot warp out of shape or change in size with the weather, make it possible to cast a large number of slabs which are exact duplicates, which renders close fitting and rapid erection easy.

Only a few of the slabs show a tendency to stick to the concrete beds, but as all are raised by one edge with a crane there is no delay on this account. None of these slabs has shown an injured surface as a result of sticking. The tendency has been overcome in each case of oiling the bed a little more carefully next time. The paraffin coat applied to each bed at the start has prevented any absorption of water from the concrete.

The work is being done by the Unit Construction Co. for the Youngstown Sheet & Tube Co.

## Stuccoing Machine With Whirling Spider Device for Throwing Stucco Against Surface to Be Treated

A stuccoing machine that has been used in many recent construction jobs of the Ferro Concrete Construction Co., is shown in the accompanying illustration. With this machine the stucco is thrown against the surface to be treated by centrifugal force, a whirling spider being employed to throw the material. It has been found requisite to feed the material in the spider in regular quantities, preferably proportionate to the speed of the spider. It also has been found by much experimenting that a certain point slightly past the vertical position of each spider arm is the best point from which to allow the stucco to fly off. Accordingly the spider is encased with a drum which is open only at the point from which the stucco material is to issue during the operation of the spider. Different shaped spiders are used as the different kinds of work require. The machine is adapted to all kinds of stucco work, no plastering being necessary when the machine is used as the stucco is thrown on the lath, concrete or brick as the case may be. The work thus obtained is claimed to be much superior in quality to work done in the ordinary way of putting stucco on after the plastering. The apparatus is operated on a moveable scaffold which has an overhead track on it from which the machine is suspended. The machine weighs 45 lb., is operated by one man and is fed by one man. A small sized machine will, it is claimed, put on as much stucco as 6 men. Cement & Engineering News, 672 Transportation Bldg., Chicago, will gladly send any of its readers a catalog illustrating and describing this machine.



Hodges' Stuccoing Machine. Small View Shows Machine in Operation on Cincinnati Concrete Stand Pipe Job.

## Cement Company Producing Potash

Within a month western Michigan's only $100,000 potash plant will be completed and in operation with a large force of men. The entire output of the new plant of the Newaygo Cement Company will be taken by the Government.

The company only recently discovered that it could manufacture potash as a by-product

# Construction Plant and Methods Employed in Building Reinforced Concrete Roads at Camp Custer, Mich.

By George A. Burley of R. D. Baker Co., Penobscot Bldg., Detroit, Mich.

I do not believe that permanent pavements were embodied in the original plans for Camp Custer, the National Army cantonment near Battle Creek, Mich., inasmuch as no contract was let for their construction until long after the building, sewer and water works contractors had been on the ground. However, from the nature of the soil, which is very sandy, it soon became evident to the engineers that gravel or macadam roads would not stand up under the heavy army truck and mule team traffic necessary to carry supplies to the various parts of the camp. They then decided on concrete for the main roads and gravel roads between the barracks.

On the 19th of July, 1917, we arrived on the grounds without any equipment, as the siding from the M. C. R. R. was not yet halfway up to the camp and the roads were bad for drawing in any heavy machinery. The following day we had about 20 teams with Western wheel and slip scrapers at work grading and a large number of men cutting and grubbing out about 1¼ acres of trees at the eastern end of the camp. We had no grade stakes to begin with, only a general line being given, and had we known that such large cuts and fills would be encountered we would have shipped in a steam shovel as it would have greatly facilitated the work. The first fill made was about 13 ft. deep and so steep were the sides of the hill that it was necessary to drag the wheel scrapers down without raising them in order to avoid running onto the teams.

All stumps that were not covered by at least 2 ft. of earth were grubbed out and those that were left in, regardless of the depth of fill, were cut off flush with the ground. The trees were trimmed up, the brush burned and the timber hauled into piles to be used for various construction purposes about the camp.

The specifications called for rolling all fills in 9-in. layers with a 10-ton roller. It was, however, found impossible to get a 10-ton roller down into the bottom of the fills and to operate it successfully in the red sand. It continually stalled and required jacking out. We then abandoned rolling with a 10-ton roller and obtained two 1½-ton Beach corrugated rollers, which gave the best of satisfaction, and I am of the opinion that in rolling soft material they are superior to a heavy machine. The first time over they go down quite deeply and seem to pack the fill from the bottom up. When the fill was brought to grade and all rolled with 10-ton rollers of the Buffalo-Pitts type, we found that the fill held the rollers up better than the original ground in the cut. These rollers required two teams each for their operation if employed continuously. All sods were removed unless covered by a fill of at least 2 ft.

Our greatest difficulty was in the congestion at the sidings. Cars were continually running over the industrial track and the heavy trucks and teams hauling lumber would knock the tracks out of line and sometimes stall so as to tie up the cars or derail them. Yet, we believe, this was the most economical way of handling the material, as the grade would have been cut up badly if we had undertaken to haul the material in wagons. Trucks would have been out of the question as in hauling lumber and other supplies for the buildings it was necessary to put brush, hay and even ensilage on the roads to get those trucks through the sand. Even with this method it was almost impossible to maintain a finished grade ready for the concrete for any distance ahead of the mixer. We finally resorted to fencing to keep traffic off the grade and a force of men was continually employed driving 2x4-in. stakes with a single 2x4-in. rail on top. Besides this cross fences were put up, for should drivers break through with trucks they would run straight down the finished grade.

Material used for the concrete was washed sand and gravel from Kalamazoo. This material was fairly clean, with the exception of times when it rained, when the top soil was not stripped off, the clay would wash down into the gravel to a greater extent than the washing plant could remove it. A number of cars of gravel were rejected for concrete and were used for shoulders. No check on this material coming in was kept, as we took the total output of the pit and then occasionally were held up through lack of sand and gravel. The cement was purchased from three nearby cement plants, Peerless, Wolverine and Burt, and the delivery was very good, but trouble was experienced because other contractors unloaded our cars, and at times we were completely out of cement due to this confusion.

The mixture of the concrete was about 1 of cement, 1½ sand and 3 parts gravel. I say "about" because the sand not being graded from fine to ¼ in., a shovelful of cement was put into the hopper from a wheelbarrow. After the concrete was finished small depressions would occur in places between the coarser aggregates, due to the settlement of the neat cement, also small pores would appear. The engineer's attention was called to this and he ordered additional cement added to make up for the lack of grading in the sand. This was an aid, no doubt, but as neat cement is not as hard as particles of sand it did not produce a wearing surface capable of resisting wear as well as a graded sand.

During the hot weather the concrete was covered with about 2 ins. of earth and kept watered for seven days. The cover was left on until time to open up the road. Great difficulty was experienced in keeping traffic off until the concrete was properly cured. Six carpenters with helpers were continually putting up barricades and fences and yet teams or trucks would occasionally cross it. In some cases so great was the demand for its use that the road was opened up sooner than we desired. Often crossings were put over the green concrete the next morning after laying to allow for hauling material from various sidings. These were made by spreading on a thin layer of earth and then covering with a double course of 2-in. plank. No bad results were noted from such crossings over the green concrete.

The warehouse section was the most difficult to construct as we had to arrange our work so as to make it possible for army trucks to obtain supplies. This necessitated our shifting up and down between the warehouses, putting in pieces here and there. The warehouse pavement was about 1,600 ft. long and about 60 ft. wide between buildings and 6 ins. thick, all of which was reinforced. This pavement was placed on a fill of 2 to 3 ft., and was flat with a slope in one direction.

The difficulty was not in obtaining labor for this work, but to get work out of the labor. All classes of labor were employed, even to Mexicans, and during the early part of the work nearly 50% of the entire force either quit or was discharged each week. This necessitated our employing a man to obtain labor and it was his duty to bring a truck load out to the camp each morning. The labor was paid 35, 37½ and 40 cts. per hour for 8 hours and time and one-half for overtime, making 11 hrs. pay for 10 hrs. work. The

variation in the price depended on the class of work done. The crews at the mixers were almost entirely negroes and proved the most satisfactory class of labor we had. The employes were housed in tents, farmhouses that were abandoned by their owners, and even garages and granaries were fitted up with army cots and blankets to take care of them. In the early part of the work they were kept in government barracks, but when the drafted men began to arrive, being continually moved from one building to another, the laborers became dissatisfied and so we arranged to take care of them in other places. All workmen were fed at the commissary, if they desired, by purchasing tickets at 35 cts. per meal or 3 meals for $1. These were charged to their account and a constant check had to be kept on this as the men gambled in meal tickets and many would overdraw their account if possible.

**Views of Reinforced Concrete Road Built at Camp Custer, Battle Creek, Mich. Upper: Main Road Back of Barracks, Practically Only Level Stretch. Middle: Between Barracks Buildings, 60 Feet Wide on Two to Three Feet Fill. Fill on Curve; Only Place Where Unloading Track Was Near Road.**

There were employed as high as 92 teams on this work, grading, hauling cement and material for the concrete road and hauling gravel from a local pit for the gravel roads. These were all taken care of in four barns, two of which were government built and the other two remodeled barns vacated by farmers forced to move from the reservation. Each barn was in charge of a "barn boss," whose duty it was to see that all teams in his barn were properly cared for and that all went to work on time supplied with the equipment necessary for that job. They also reported any teams "standing in" through lack of teamsters so that our employment man could supply new ones each morning or pick out some teamsters from among the laborers. It was also their duty to advise the office as to their requirements for hay and grain. Baled hay and oats in bags were purchased in carloads. By order of the sanitary department all litter had to be removed from the barns each day and, as this had to be hauled about 3 miles, one team was detailed from each barn for this work. To take care of horseshoeing and general repairing a fully equipped blacksmith shop was built and two blacksmiths employed. Teams were paid at the government schedule of 30 cts. per hour, time and one-half for overtime and 10 cts. per hour being taken out for feeding. This made a charge of $1.10 per day for feed, which we found at the price of hay and grain barely covered the cost. All teamsters were hired by us and received 35 cts. per hour. Where dump wagons were used the team owner received 50 cts. per day rental. The greatest number of men employed on this work was about 280. This large force was required in order to carry on the gravel road construction along with the concrete.

All laborers were given brass number checks and one timekeeper covered the whole job. In the first part of the work the men checked in at stiles morning and afternoon and out at noon and night. The timekeeper also checked them on the job in the forenoon and afternoon. The checking of numbers at the stiles consumed too much time and was of little value because of the large number employed, so was abandoned later when each foreman was given a time book and checked the men in and out, turning the book over to the timekeeper. The week ended on Saturday night and pay day was Wednesday. Payment was made by check, which made considerable office work.

Ditches were built on each side of the road to drain to the natural water courses with cross culverts of Armco corrugated pipe placed at close intervals for cross drainage. Adequate disposal of storm water was not provided in many cases because camp buildings were built without regard to natural water courses. The shoulders were carried out with 6 ins. of gravel 2 ft. from the concrete on each side and thoroughly rolled, and the roadway made 24 ft. over all. This gravel was obtained from a local pit and clammed into Studebaker dump wagons.

"Sacrifice economy for speed," was the order from the constructing quartermaster. Yet this did not in any way overcome the difficulties in connection with the work. In order to facilitate the construction of the hospital itself we placed a large grading force on the railroad with the understanding that the railroad was to be torn out and the heavy grade used for pavement. With only 3 days' notice we were told that the railroad would remain and we must grade through to the hospital alongside the railroad. Conditions like this made it difficult to plan the work ahead in order to keep two mixers going continually, but we did this from the time we started until the job was finished.

The railway sidings were very badly congested with building material, tile, water works pipe, etc., and although the mixer was working within a few hundred feet of a siding it was sometimes necessary to haul the cement a mile. Switching service was very unsatisfactory. Often the unloading gangs were laid off with material in the city yards that could not be brought to the camp in time.

Considering the difficulties encountered we believe good time was made, as from the 20th of July until we began loading equipment on the 29th of November, 60,360 yds. of concrete were placed and about 8 miles of gravel road built and 3,000 ft. of 12-in. crock laid. Five hundred feet of this concrete was laid on an old road bed and the balance all passed through woods and farming country, with big cuts and fills and many curves. At one point the concrete is laid over a fill of 30 ft., which was made with a steam shovel and cars. It will be interesting to note what settlement takes

place at this point. The actual mixing time in placing this concrete, which is equivalent to building approximately 6 miles of 18-ft. road, was 3 months and 10 days.

No accurate costs on the road work can be given. This is due to the extra work done, such as railroad grading and digging the basement for the laundry, for which no separate cost account was desired by the government. And as this work took in so many conditions that are not met with in the ordinary road building we did not consider a cost record of any value to us.

## Cement Drain Tile Factory

The Camden Cement Tile Company, Camden, Ind., is getting out material and making other preparations for the erection of a substantial building for the purpose of housing its machinery and complete equipment in more comfortable quarters, in this way enabling them to operate regularly throughout the winter. The business of the company has increased to such proportions that it is impossible for them to keep their orders filled without keeping busy twelve months during the year. They operate a Dunn drain tile machine and a Kent continuous mixer.

## Concrete Ornamental Moulds

Never before in the history of concrete work has the use of concrete been so great for ornamental purposes as at the present time. There seems to be no limit to the possibilities in this line and concrete lends itself so readily to the manufacture of ornamental articles that it proves most attractive and a very interesting line of work. There is a satisfaction about turning out a

handsome piece of work that appeals to every concrete worker, and the profits in this line are also very satisfactory. You can make a vase similar to the following illustration with about one sack of cement. This vase would sell for not less than $5.00 and every house-wife wants a pair of these as soon as she sees them. This illustration shows one of the most attractive and beautiful lawn vases on the market at the present time. It is sold by the W. E. Dunn Mfg. Co., 414 24th St., Holland, Mich., who are extensive manufacturers of concrete machinery of every description and their new catalog shows the largest line of ornamental moulds made. It will pay contractors to have a copy of this book if for nothing else than for reference. It describes everything shown in the concrete machinery line and gives much valuable information of every description. All moulds for ornamental purposes, are all made in four sections and are hinged so as to draw easily from the finished mould. The designs are clear cut and

attractive in appearance and every contractor will do well to consider the establishment of an ornamental department in connection with their regular business. Every article produced will prove an advertisement for their work and every live, up-to-date, concrete man realizes that they cannot do business without advertising. There are a hundred and one different ways in which articles of this kind tend to bring added sales to their business, and will increase their profits to a large extent, and put their business on a more satisfactory and profitable basis.

## Concrete Burial Vault Industry

The use of concrete burial vaults during the last few years has increased at an astonishing rate, reflecting a demand caused in part by the general development of the Concrete Industry—a demand for concrete products of all kinds. Then there has never been a period during which the undertaking profession has made so great progress in all departments as in the last ten years; consequently a much higher grade of funeral furnishings of all kinds are being used now than ever before, and therefore there has been an increased demand for a higher state of perfection in burial vaults. Then again the public in general are being educated out of the old-time method of burying with only an ordinary wooden box to protect the remains; and along with this education has come a spirit of investigation as to what kind of burial vault is best, the result of all this being that the concrete vault is more in demand than any other.

The Automatic Sealing Vault Co., 216 E. River Street, Peru, Indiana, has not been slow in realizing the truth of the above statements, and has spared neither time nor money in bringing the Automatic Sealing Vault up to the highest standard of perfection.

At the time this vault was invented, there were a number of two-piece concrete vaults, besides several sectional vaults on the market; but all belonged practically to the same class, as they all depended on having their different sections cemented together in order to make them water-tight—a process which is of doubtful efficacy for the simple reason that the chemical action which hardens a mass of concrete by causing the elements of which it is composed to crystallize is exhausted in the process; and any attempt to unite two or more sections of seasoned concrete with fresh cement simply results in a chemical action taking place in the fresh cement only, causing it to crystallize, but the sections are not united as there is no affinity in a mass of seasoned concrete for the elements of which it was originally composed. The fresh cement may cause the sections to adhere together; but the old joint still remains, through which the water, it is claimed, will eventually filter.

## Screening and Grading Gravel on the Job

There is very little "pure gravel" to be had anywhere; it comes in pockets and layers, mixed with sand and other things that would spoil your mix on a concrete job. Yet all through such stuff is lots of good, usable gravel.

Then there is the hauling problem. Even when you can buy a good grade of gravel at a distant pit at a fair price, you still have to count in the freight cost, which is a heavy item in itself. On top of that is the trucking problem at your end of the line.

Upon a great many contract jobs, as well as upon town and county work, portable gravel screening plants are being used to advantage. The Galion Imperial screening plant is one of them.

With this outfit you can use the run of the pit, no matter how uneven the strata are. Scoop it out at one end, dump it in all together and run it through the plant as shown in the illustration. Not only is the gravel separated from the sand, but it is graded strictly according to size and deposited in separate compartments.

The revolving drum or screen and the machinery which operates it are supported on a framework at each end, built so that it can be lowered for moving or shipping. In the same way the lower end of the elevator can be swung clear, to pass obstructions on the ground. The same adjustments make it possible to change the pitch of the screen, to control the flow of material.

Figures compiled from actual experiences of users show that screened and graded gravel of the best commercial quality may be had through this plant at a cost of between 25 and 30 cents a cubic yard, loaded on the wagon.

Contractors and road builders who figure on the special economy features of the equipment they use will be interested in the grading features. The middle section of the screen works out the small gravel; the end section, having larger holes, screens out the third size; everything larger than this falls out of the lower end of the cylinder, which is open, and into the fourth and last compartment of the bin. The sand and three sizes and grades of gravel fall into different compartments and are kept entirely separate from one another. You can drive under any one of the four compartments and load with any size desired. The bins of this plant are arranged to empty from either side. CEMENT AND ENGINEERING NEWS, 672 Transportation Bldg., Chicago, will gladly send interested parties a catalog, giving sizes and prices of this serviceable machine.

The Screening Plant Moves Along as the Construction Progresses.

## Economy in the Design of Reinforced Concrete Buildings

The paper on "Economy in the Design of Reinforced Concrete Buildings," which was presented before the Boston Society of Civil Engineers by Clayton W. Mayers of the Aberthaw Construction Co., has been reprinted for free distribution. Copies may be obtained by applying to the Aberthaw Construction Co., 27 School street, Boston.

## Cuban Portland Cement

The report of the Cuban Portland Cement Corporation for the period ended April 1, 1918, is issued. It shows current assets of $419,755, and accounts payable and accrued interest amounting to $189,665.

The report says in part: During the period to April 1, 1918, construction work was actively continued, and while work was considerably retarded on account of difficulty in securing materials and labor, as well as transportation, due to war conditions, the plant is now in operation and producing a very high grade of Portland cement.

The business outlook in Cuba is very satisfactory; our cement has been accepted by all the principal contractors and dealers at an attractive price, which should insure a very satisfactory return on the investment, and while undoubtedly freight rates in time will return to normal, it is fair to assume that we will always have an advantage over American manufacturers of at least $1 per barrel, which in itself is a fair profit on our product.

# Cracks in Concrete

### Wetting, Drying and Other Influences Studied by Specialists of the Office of Public Roads

Cracks in concrete pavement will likely be a less baffling problem to builders as the result of a seven-year study of their causes recently concluded by specialists in the office of public roads of the United States Department of Agriculture. Observing particularly the expansion and contraction due to alternate wetting and drying of concrete, records were made of the values of these moisture and temperature movements under various conditions. A waterproof covering such as coal tar, it was learned, prevents a rapid change in moisture content and greatly retards the expansion and contraction.

Other important results which should be of value to concrete workers, especially highway engineers, are contained in a recent report of the investigation, Bulletin 532 of the Department of Agriculture, which will be sent free on application.

The report makes no attempt to apply the results obtained to the practical side of road construction, although certain general conclusions drawn, it is said, may be capable of immediate utilization by engineers. These conclusions follow:

#### Conclusions Drawn from the Test

1. Neat cement when allowed to dry, first contracts rapidly, then more slowly. The amount of contraction seems to vary with the cement, size of specimen, and condition of atmosphere in which drying takes place. The amount at 28 days is about 0.1 per cent and at 6 months about 0.2 per cent.

2. Mortar contracts on hardening in air and expands on hardening in water. The contraction in warm, dry air at 28 days is about 0.045 per cent for 1:2 and 1:3 mortar and at 6 months is 0.078 for 1:3 mortar and 0.085 for 1:2 mortar: The expansion in water is 0.01 per cent for 1:3 and 0.017 for 1:2 mortar at 28 days, and at 6 months 0.013 for 1:3 and 0.02 per cent for 1:2 mortar.

3. Both 1:2:4 and 1:3:6 concrete contract on drying in warm, dry air from 0.04 to 0.07 per cent at 6 months. When hardening in water an expansion of about 0.01 per cent takes place at 28 days and 6 months in 1:2:4 and 1:3:6 concrete.

4. The richness of the mix of concrete seems to exert a small influence on the contraction; the richer the mix the greater the change in length.

5. The concrete alternately wetted and dried may be made to expand and contract owing to these causes. The expansion due to wetting is more rapid than the contraction on drying. The thoroughly dried specimens of concrete do not recover their original wet length when immersed.

6. Concrete stored in the outer air and exposed to the weather does not contract to the same extent as the above described specimens except under very dry conditions.

7. A waterproof covering such as coal tar prevents the rapid change in moisture content and greatly retards the expansion and contraction.

8. Reinforcement decreases, but does not prevent, the shrinkage and expansion of concrete due to drying and has no effect on temperature changes. Reinforcement cannot, therefore, entirely prevent cracks, but seems to distribute them and keep them small.

9. Concrete roads are affected by both temperature and moisture. When the drainage is good and the sub-base not wet, the temperature effects seen to be most important. A wet sub-base may add to the temperature expansion by about 0.01 to 0.02 per cent. The restraining effect of friction at the base seems to be almost negligible when figuring temperature and moisture expansion and contraction. In very dry climates shrinkage due to drying must be added to contraction due to fall in temperature. A shrinkage of 0.04 per cent (one-quarter inch in 50 feet) is a safe allowance due to drying.

10. Temperature at time of construction of road should be considered in designing joints. Cold-weather construction requires a full allowance for temperature expansion and, on wet sub-bases, for moisture expansion also. Hot-weather construction theoretically requires no joints at all, even in wet sub-bases, as the temperature contraction exceeds the moisture expansion. However, the difficulty of keeping the cracks clear probably renders joints imperative.

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# Car Supply for Stone, Sand and Gravel

The following rules are promulgated for the guidance of all carriers in distributing open top equipment:

1. Open top cars, suitable for such traffic, should be furnished preferentially for the transportation of coal, coke and ore.

2. Available open top cars, not suitable for the transportation of coal, coke or ore, may be furnished for the transportation of stone, sand and gravel, and when so furnished shall be used preferentially for highway maintenance materials.

3. Open top cars, suitable for the transportation of coal, coke and ore, and available on coal, coke or ore producing roads in excess of the demand of such commodities, may be furnished for the transportation of stone, sand and gravel, and when so furnished shall be used preferentially for highway maintenance materials. The return movement to mines or ovens should be utilized wherever practicable in furnishing car supply for stone, sand and gravel. Every endeavor should be made, consistent with keeping up the production of coal, coke and ore, to furnish shippers of stone, sand and gravel with a minimum of forty per cent of their normal weekly transportation requirements.

4. Roads which are not producers of coal, coke or ore must not use foreign open top equipment for stone, sand or gravel shipments, except for one load in the course of the return movement to mines or ovens.

5. Where the transportation needs of essential road construction or maintenance projects cannot be met by car supply furnished in accordance with the above rules, the State, County or Municipal officials in charge of the work, should, through their proper State Highway Department, apply to the Director of the Bureau of Public Roads, United States Department of Agriculture, Washington, D. C., for assistance. Such applications will be considered by representatives of the Department of Agriculture, the War Department, the War Industries Board, the Fuel Administration and the Railroad Administration, and, in accordance with the recommendations of such representatives, the Car Service Section will endeavor to furnish car supply necessary for approved essential road construction or maintenance.

It must be understood that car supply for stone, sand and gravel must not be permitted to jeopardize the essential production of coal, coke or ore. If at any time such a result is apparent on individual roads, or generally, orders will immediately be issued to curtail the car supply for stone, sand and gravel.

# "Trailerize" Motor Trucks Says Freuhauf

"If the 435,000 motor trucks in the United States were operated at 80 per cent of the efficiency possible with semi-trailers, the total tonnage hauled by these units every twelve months would be equal to 1,423,635 train loads of 55 freight cars each, or eight times as much as these trucks are now estimated to be hauling annually," declared H. C. Freuhauf, general manager of the Freuhauf Trailer Company.

"According to recent estimates the 435,000 motor trucks in this country have an average load capacity of 2½ tons each. However, careful investigation developed the fact that the average motor truck operates at about 35 per cent efficiency. That is to say that a big majority of the motor trucks are not loaded to their full capacity while being operated.

"Assuming that each truck makes an average of four trips per day for 300 working days a year, the motor trucks now in service if operated with semi-trailers at 80 per cent efficiency, and carrying a load in one direction, would show a gain per year of 6,144 tons per truck or 2,672,640,000 tons per annum on all the trucks in the United States.

"If these trucks, equipped with trailers, could carry loads in both directions this annual gain would be equal to 106,905,600 freight car loads of 50 tons each. The magnitude of this extra tonnage is almost inconceivable, but it is 53 times the total tonnage handled through the Great Lakes during 1917.

"Increased operating efficiency in motor trucks is imperative. The freight car and locomotive shortage is so great that we should make the widest and best use of our transportation facilities.

"It is true that many manufacturers, lumber dealers and operators, and business men in other fields of industry have become aware of the economies resulting from the use of semi-trailers. But they are in the great minority.

"They know that a horse can pull a much heavier load than it can carry, but they are slow to apply the same reasoning to a motor truck.

Device for Quick Loading of Trucks from Railroad.

"Our experience, based on practical demonstrations, has been that a semi-trailer and truck will haul three times as much as the truck alone—and over the same roads and under the same conditions. This fact goes to show that although production of trucks for use in the United States may be curtailed to a great extent, because of the government's demands, there is a practical way to treble the present motor truck tonnage in this country."

Motor Truck and Dump Trailer.

## Austin Cube Mixer

F. C. Austin Company, Inc., Railway Exchange Building, Chicago, have issued a most attractive catalogue of the Austin Cube Mixer. The opening pages picture the gold medal, and certificate accompanying it, awarded the company at the Panama-Pacific International Exposition. The following pages are profusely illustrated and superbly printed, picturing the use of these famous mixers in all parts of the world.

## Suggestions on the Use of Explosives in Quarrying

The following suggestions on the use of explosives in quarrying are taken from a recent bulletin of the U. S. Bureau of Mines:

**Warning Signals** — If possible, blasting should be done before or after working hours, while workmen are absent from the quarry. In any case ample warning should be given. In some quarries two whistles indicate small "pop-hole" shots, and three whistles those of a more dangerous character. If a series of shots are to be fired, warning whistles should be sounded both before and at the end of the blasting, in order that there be no premature leaving of shelter.

**Shelters** — Safe shelter should be sought for every blast. One should be protected from flying fragments and also have overhead protection from small pieces, which may be blown high in the air and fall almost vertically. There is great danger, especially in granite quarries, of small fragments being projected to so great a height that men may leave their shelter before these fragments fall. Semi-circular cone-shaped shelters of sheet metal are recommended. If provided with a ring at the top, they may be easily placed in any desired position by means of the quarry or yard derrick.

**Firing Shots** — The man who loads should fire, and no one else should be allowed to touch the switch or firing machine. Accidents have resulted from misunderstandings and confusion of orders when one man loads and another one fires.

One method of firing cannot be too strongly condemned. It consists in filling a hole with powder and then pouring a trail of powder over the rock surface for a distance of 5 or 6 feet. By scratching the rock surface with a steel drill the trail is ignited and quickly fires the charge. The time allowed for seeking safe (?) shelter averages from 2 to 3 seconds. No further comment is necessary.

Plenty of time should be allowed before approach to the danger zone after firing, especially if fuse is used. A delayed discharge may smoulder several minutes. Careful investigation should be made of misfires and incompletely detonated charges.

A source of danger in making subsequent shots is in loading a second charge into the hole too soon after the explosion has taken place. The rock may be hot, or burning fragments of fuse may remain in the hole.

In case of misfire a charge of powder may, if fuse alone was used and no detonator, be removed after careful removal of the stemming, both stemming and powder being thoroughly wetted during the process of removal, but if a detonator is present in the charge its removal should not be attempted. Charges of dynamite should never be removed. The process is too dangerous. A second hole should be drilled not less than 2 feet away; and after blasting, careful search should be made for pieces of dynamite which have not exploded. If the directions for wiring, given in a previous paragraph, are followed, misfires should be of rare occurrence.

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## Concrete Mixers, Hoists, Pumps, etc.

A 44-page catalogue, illustrating and describing the Boss building mixers, pavers, grouters, hoists, backfillers, material elevators, pumps and concrete carts, has just been issued by the American Cement Machine Co., Inc., Keokuk, Iowa, who will be glad to send a copy gratis to any of our readers. The catalogue contains construction details and specifications for the mixers.

**A 3½-Ton Motor Truck, Owned by the Mississippi Sand Co., Carrying a More Than Capacity Load of Sand Up the Steepest Hill in Alton, Ill.**

## Concrete Freight Cars

Chicago is to strike another blow for the winning of the war by building the first concrete freight car in the world, says the Chicago American.

The car will be built under supervision of the United States railroad administration and tested by it.

If it is a success it should mean that thousands of freight cars can be rapidly thrown into the balance to relieve the car shortage that caused last winter's coal famine and threatens another next winter.

J. B. Strauss, president of the Strauss Bascule Bridge Company, is inventor of the new car, upon which work will be started as soon as he has completed detailed plans and specifications.

The first car will be a gondola, its inside measurements to be 40 by 90 feet and 4½ feet deep. Its body will be entirely of concrete, reinforced with bar steel.

Florence Sullivan, executive secretary of the Cooperative League of Building Trades and Industries, which is taking a deep interest in the concrete car project in connection with its other war building promotion, to-day explained the advantages of the concrete car.

"The steel in the body of this car," he said, "will weigh less than 6,000 pounds. It is the easily procured bar steel, the use of which will not interfere with other war construction. The ordinary freight car requires at least 30,000 pounds of rolled steel, the kind that they use in building ships and submarines."

# Use of Cement Gun in Lining Tunnels*

By George S. Rice, Chief Mining Engineer, Bureau of Mines, Pittsburgh, Pa.

About 1907 one of the large colliery companies of northern France, Mines de Bethune, began, in a new colliery, the use of a light, reinforced-concrete lining for all its cross-strata tunnels. When I visited this colliery in 1908, two miles of this lining had been constructed. It was only 5 or 6 in. thick, and the mixture was lean. Moreover the reinforcement was so very light that the cement work seemed to be hardly more than self-supporting and probably bore little of the weight of the encompassing strata. In other words, it apparently served merely to protect the strata from weathering.

The lining served its purpose satisfactorily, as I found out when I again inspected it three years later (1911), by which time more lining had been built. On the other hand, timbered tunnels in the same formation had given much trouble. This demonstration convinced me that the important factor was to protect the strata from the action of the air. The cost of the lining in the Bethune mine was relatively low under the conditions then prevailing in France, only $5 per lineal yard, which figure would have to be doubled if an estimate were to be made of the cost of such lining in this country, even prior to the war. The general method of lining seems an admirable one, although the first cost was considerable, but, in the long run, it should be economical because it eliminates the cost of timbering and of cleaning up of falls of roof inseparable from the maintenance of a roadway and it also serves as a protection for the men against injury from roof and rib falls.

Concluding that the protection of the natural roof and ribs against weathering, a process for which oxidation is principally responsible, was probably the important factor in preventing subsequent falls, I studied the problem carefully in the hope of determining what sort of inexpensive coating might be applied to a shale roof to prevent its coming in contact with the air currents, with the hope of thereby saving inexpensive work later on, and, furthermore, of lessening accidents from falls.

In 1910, when I saw the cement gun exhibited at the convention of the National Association of Cement Users, held in New York, I thought that here was an apparatus that would furnish the agency I sought for the placing of a more or less impervious coating on the mine walls.

For many years grout has been pumped into cavities behind tunnel and shaft linings. However, G. L. Prentiss, in a paper given at the meeting of the cement users above referred to, on the "Use of Compressed Air in Handling Mortars and Concrete," stated that compressed air was first used for the transporting agent in placing concrete and mortar in France, for the repairing of tunnels on the Paris-Lyons-Mediterranean Ry., France. This was in 1906. The linings of the tunnels were leaking and the arches were thereby becoming weakened. The engineers attacked the problem by using a machine consisting of a charging hopper connected with a pressure tank, into which air was forced by a compressor at a pressure of 40 to 50 lb. per square inch. The tank was first charged with a grout composed of cement, sand and water, and after the pressure had been put on the material was forced out through a line of flexible hose to a discharge nozzle, which was applied to holes drilled through the arch of the tunnel. It is stated the results from an engineering standpoint were satisfactory, but the machine gave trouble, as it and the hose became clogged with grout, and the process was therefore tedious and expensive.

Various other attempts were made to use compressed air for blowing cement or concrete mixtures through pipes, and according to Mr. Prentiss, J. W. Buzzell and W. H. Larkin, in 1909, undertook work in this country of that nature. They found that they could force a mixed concrete through a 4-in. pipe a distance of 400 ft. with a pressure of 40 to 50 lb. per square inch, a higher pressure than this not being found advantageous.

The predecessor of the cement gun appears to be the long-used spraying device employed for the painting and whitewashing of rough work, like railroad freight cars. Here the paint or whitewash is ejected from a nozzle by means of compressed air. Nevertheless, this method, like those previously described, used the compressed air to transport the grouting, concrete, or whitewash in liquid mixture, whereas the cement gun operates on a different principle; namely, to transport the cement and sand dry, wetting it only at the nozzle. It is not, of course, possible to employ crushed stone in the mixture, which must be composed of cement and sand only.

As the cement gun is a patented machine, I feel it is necessary to explain that I have never had any financial interest in it, and that I am concerned in it only as a means of obtaining a certain practical result in the mines.

Mr. Prentiss described in the paper, to which I have just referred, a variety of applications of compressed air to the placing of cement mixtures, some as early as 1910. The method was used for applying stucco and cement-sand mixtures; thus it was used for coating a frame building with stucco. Brick walls and fences were by this means covered with stucco or cement. He also instanced its use in the construction of the General Cement Products Co.'s buildings; the coating of structural steel, with and without the addition of reinforcing wire mesh; the fireproofing of the interior of wood-lined buildings; the building up of sections of cement pipe from a wire-mesh skeleton; the use for tree surgery; and the very important application of lining the iron syphons in the water supply system of New York. These syphons were 11 ft. 3 in. in diameter, and the total length to be treated was nearly 14,000 ft.

After seeing the demonstration of the gun in the exhibition of 1910, and the way the cement coating, sometimes termed "gunite," would stick to steel and stone, I concluded that here was a machine which offered a means of applying a thin cement coating to the roof and ribs of an entry or tunnel before weathering took place.

When the experimental mine of the United States Bureau of Mines, located near Bruceton, Pa., had been fully developed for its purposes, a cement gun was loaned in 1914 to the bureau by the Cement Gun Co., for trial applications. The manufacturers at that time, not having turned their attention to its mining possibilities, could not be induced to lend the gun without considerable negotiation. It was found, after experience had been gained in handling the gun, that a cement-sand covering, varying from a thin coating to one several inches thick, as desired, could be placed without difficulty on the coal ribs. It would even stick to the "draw slate" or clay band. Moreover, a thin to a ¾-in. coating could be made to stick to the roof without the use of wire mesh.

It was also found to be of great advantage in mak-

*Abstract of a paper entitled "Weatherproofing Mine Roof and Walls and Making Tight Stoppings with Cement Gun," presented Dec. 6, 1917, at the Pittsburgh meeting of the Coal Mining Institute of America.

ing stoppings practically air-tight. In October, 1914, when the American Institute of Mining Engineers met at Pittsburgh, an exhibit was given at the mine of the use of the cement gun for these purposes. The cement-sand lining has been extended in the mine entries from time to time until now nearly 1,000 lin. ft. of entry has been thus lined, the roof coating being from ¼ to ¾ in. thick and the rib covering from 1 to 2 in. thick.

These coatings have been found very successful in the prevention of weathering on the sides and roof. It is true that from time to time repairs have had to be made on the roof coating, but this, in part at least, seems to have been due to the effect of the violent explosions produced in our experiments, of which over three hundred have been conducted. After many of these the coating would shell off the roof in patches, particularly where a void had developed behind the coating. These voids, or spaces, are caused by the concrete shell pulling away from the main roof where it is shaly, taking some scale with it. The concussion or rush of the explosive blast later knocks off the shell.

In offsets, where the work is protected from the explosions, the coating has rarely come off. As a result of these experiments it was thought that if the coating was well put on, particularly when the roof was fresh and sound, it would stick tight for a long period under ordinary mine conditions. Since the conditions at the experimental mine were abnormal, the failures in patches of the roof cannot be considered to condemn the system and there has been no trouble whatsoever from the coating on the ribs and draw-slate. This is most important, as those who have operated in the Pittsburgh beds well know. Usually disintegration which leads to falls in the roof comes about through draw-slate over the coal softening, thereby widening the roof span. Then the roof falls and the widening and cutting back goes on, making the timbering more and more expensive.

These tests at the experimental mine were brought to the attention of leading mining men, and this caused some of them to try experiments of their own. Trial of the method was made slowly at first, but the representatives of the bureau constantly urged further experiments as the change seemed to promise increased safety as a result of better lighting, the reduction of falls and the danger of coal dust explosion propagation. Now the development is proceeding more rapidly.

The cement gun is also most useful wherever iron or steel beams or posts are employed underground or in shafts, as it prevents the metal from rusting.

An excellent description of the cement gun was presented by Carl Weber in a paper before the Western Society of Engineers on March 9, 1914. It described the gun as it appeared in earlier stages of its development. A good description also appeared in Engineering (London) for June, 1916. These articles show the remarkably wide adaptability of the cement gun to other uses than those already mentioned, such as the repairing of concrete walls in subways, the rehabilitation of retaining walls, the lining of reservoirs, the repairing of street-car tunnels and the lining of coal bunkers.

According to Mr. Weber, the sand-cement material leaves the nozzle with a velocity of about 300 ft. per second. In striking a hard surface the sand rebounds and falls down, only the neat cement adhering until a coat is formed thick enough to hold the sand. Then the rebound lessens and the coat is built up until the desired thickness has been obtained. The tightness by which the sand-cement coating is placed by this method is of great value. A report was made by Westinghouse, Church, Kerr & Co., testing engineers, which was quoted at length in the paper just referred to. It bears testimony to the quality of the cement-sand coating produced by the cement gun. Their conclusions were:

In all of the tests made the products of the cement gun were shown to be superior to good hand-made products of the same kind. The degree of superiority varied between wide limits.

In tensile strength the gun work excelled hand work in every case by amounts ranging from 20 to 260 per cent.

In compressive strength the excellence of the gun work was even more marked, ranging from 20 to 720 per cent better than hand work.

In the matter of surface permeability the gun work absorbed from 7-10 down to 1-20 as much water per hour, per unit of area as the similar hand-made surfaces.

As regards absorption of water, the hand-made mortars took up from 1.4 to 5.3 times as much as the gun-made mortars.

The percentage of voids of the gun-made product ranged from 52 to 75 per cent of that in the hand-made product.

The adhesion of the gun-applied mortars was on an average of 27 per cent better than that of the hand work.

## Cement Railroad Ties a Success

The accompanying illustration shows a piece of track laid with cement ties on the Riverside, Rialto & Pacific Railroad, a short line operating from Riverside to Rialto, Cal. These ties, which were invented by J. H. G. Wolf and others of San Francisco, were put

down in 1913, and none of them, save in the case of 1 out of 60 laid, have been renewed in five years, although they are subjected to the severe tests of both steam and electric traffic. They are of hollow cement construction, and the rails are connected to them on wood and steel resilient tieplates. The trains running on this road are pulled by locomtives weighing 87 tons, and the steel cars carrying cement weigh, loaded, 140,000 pounds each. The normal traffic speed is 45 miles per hour.

## Portland Cement Association's Standards for Aggregates

Recommended practice for concrete bridge construction of the Portland Cement Association is covered in a recent booklet issued by the association. The following paragraphs are of interest to crushed stone and gravel producers:

(a) **Fine Aggregate**—Fine aggregate should consist of natural sand or screenings from hard, tough, crushed rock or pebbles, graded from fine to coarse, with the coarse particles predominating. Fine aggregate when dry should pass a screen having four (4) meshes to the linear inch. Not more than twenty-five (25) per cent should pass a sieve having fifty (50) meshes per linear inch, and not more than six (6) per cent should pass a sieve having one hundred (100) meshes per linear inch. Fine aggregate should not contain injurious vegetable or other organic matter, as indicated by the Colorimetric Test, nor more than seven (7) per cent by volume of clay or silt as determined by washing the sand thoroughly in one hundred (100) per cent excess of water and allowing the silt to settle for one (1) hour. Field tests should be made by the engineer on the fine aggregate as delivered at different times during the progress of the work, and, if the above requirements regarding organic matter and silt are not fulfilled, the material represented by the samples should be rejected.

(b) **Coarse Aggregate** — Coarse aggregate should consist of clean, durable crushed rock or pebbles graded in size, free from vegetable or other organic matter and should be practically free from soft, flat or elongated particles. The coarse aggregate should be well graded from 1½ inches down (1 inch for reinforced concrete), not more than five (5) per cent passing a screen having four (4) meshes per linear inch.

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## Eliminates Guesswork in Concrete Products Factories

The guesswork and mistakes of careless labor are eliminated in the Kent continuous mixer, which is specially designed for concrete products plants. The automatic force feed proportioning device absolutely guarantees the accurate proportion of materials whether they are wet or dry. This feature aids greatly in securing a uniform and thorough mixture. The Kent mixers have proven their reliability on Government and municipal work, and are approved by leading architects and engineers. Seventy per cent of the bigger block, tile, brick and specialty concrete products plants of the country use the famous Kent mixer. They save labor, because they perform the measuring, dry mixing, wetting, wet mixing and discharging. They save money, because they shorten your pay roll, and because they operate continuously, thereby greatly increasing the daily output of a cement block or tile machine. Write the Kent Machine Company, Kent, Ohio, for their catalogue giving detailed description of all sizes and models of Kent mixers.

**View of Concrete Product Plant Equipped with a Kent Proportioning Continuous Mixer. Three Kent Mixers Are Being Used in the O. C. Barbor Concrete Co.'s Plant at Barberton, O., Which Is the Largest and Most Modern Up-to-Date Concrete Products Plant in the World.**

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## Portable Compressor Outfit

The portable compressor outfit illustrated herewith is an evolution in the way of getting compressed air at a low cost and with a light portable outfit.

The old style portable outfits were nothing more than an ordinary stationary type of engine and an ordinary stationary type of compressor with a very inconvenient and very cumbersome type of cooling system, all bolted to a truck.

This machine is assembled in the same way in which the many cylinders are combined in an automobile engine. Because the cranks are set opposite one another the machine balances itself and will stand perfectly still on the softest kind of ground and can be operated at any angle without difficulty.

There are very few pipe lines or connections on the machine and these are all rigid because the machine is hung low, and being constructed entirely of steel, stands up well in use.

The machine is entirely automatic in every way. The speed can be adjusted at will, depending entirely upon how much air is required and remains constant.

The air pressure is also regulated by hand and remains constant as required. This means that after the machine is once started it needs no further attention.

A small amount of water is needed. Only a few buckets per day. The amount of gasoline is in direct proportion to the amount of work being done. For instance the No. 2 machine, which is more commonly used for drilling work and blasting operations, will consume three to five gallons of gasoline per day on the heaviest kind of work.

Though this machine is only rated at 24 cubic feet of air, it is capable of operating the ordinary non-rotating drill for road construction, in ordinary quarries, for making trenches and for excavations of any kind; for drilling field-stone or for doing any kind of drilling work preparatory to blasting.

Costing only $325, it comes within the reach of almost anybody. Even a farmer who has a rocky piece of ground can use the machine and make it pay him on the job.

The picture on this page is a drilling operation showing how one of the No. 2 outfits mounted on a horse-drawn truck is being used at the Palisades Park opposite New York city. This contractor is drilling rock and blasting on road work.

It is apparent that any quarry can be easily equipped with a machine of this kind. Even though the quarryman has a large steam-drill, which can be only operated during the warm months in the year, owing to the dripping of water and the freezing of the pipe, it would be possible for him to roll the small machine into his place and five minutes afterwards it would be ready to go to work with his drills.

Sometimes the steam-drill is cumbersome for the ordinary contractor on the job. As the small machine weighs

only 1,200 pounds, it is possible to move it about very quickly. Gas companies, water companies and street contractors have bought these outfits.

For road building or rock drilling it is possible to hitch one of them to the back of an ordinary automobile for transportation. These machines are used, of course, on many kinds of rock and the speed of drilling depends on the nature of the rock and also the care with which the operator sharpens his drills. The ordinary 1¼ or 1½ inch hole put down 2 feet, will require from 3 to 5 minutes. Tests of continual operation of about 10 hours show 150 to 200 feet of holes drilled per day. This, of course, is many times the number of feet that can be drilled by hand. Comparative tests show drilling of 160 feet against 11 feet by hand.

A great convenience in the use of these machines is that when the blast is to be set off the machine can be rolled aside. The hose, of course, can be rolled up, the operator stepping back and there is no danger of pipes

**Drilling Operations Showing How One of the No. 12 Outfits Mounted on a Horse-Drawn Truck Is Being Used. This Contractor Is Drilling Rock and Blasting on Road Work.**

or anything else being damaged by reason of the rock falling on them.

Cold weather does not affect the machines in the least. The hoppers, themselves, are very small and it will take a very hard frost to do any damage.

There are no pipe lines to freeze up nor dripping water to form ice nor annoy the operator.

Every machine is sold on trial. The manufacturers guarantee that the machine will do the work or it can be returned for full credit. Write CEMENT & ENGINEERING NEWS, 672 Transportation Building, Chicago, for catalog and price.

## Pneumatic Concreting for Tunnels

The Southern Pacific Railway Company has decided to enlarge seventeen tunnels through the Tehachepi and line them with concrete. The work will be prosecuted without interfering with traffic. The concrete will be placed by pneumatic pressure, the outfit consisting of a concrete mixer, giant air compressor and 230 horse-power gasoline engine mounted on flat cars stationed outside the tunnels. Experiments have been made by J. Q. Barlow, assistant chief engineer of the Southern Pacific, and a practical plan for carrying on the work has been devised.

## Ornamental Concrete Street Lighting Standards

Established in 1913, the American Cement Products Company, located at 3248 Long Beach avenue, Los Angeles, has become one of the important manufacturing concerns of southwestern California.

This company specializes in the manufacture of Marbelite ornamental lighting standards. These posts are patented and are far superior to anything of this kind manufactured in the East. These ornamental street lighting standards have been installed in all of the principal cities on the Pacific Coast.

The plant of the American Cement Products Company is completely equipped and up-to-date in every respect, comprising a pattern shop, acid tanks, mixing machines, curing tanks, curing rooms and warehouses. Adjoining this plant are the main offices of the company.

The officers of the company are E. B. Blinn, president; L. L. Elliott, vice-president; Henry Barkschat, secretary, treasurer and general manager. These, with E. J. Pyle, Clifton Horn and W. C. Crowell, comprise the board of directors and all of the stockholders.

The owners of the American Cement Products Company also own and operate a plant on Alameda street, under the name of The National Concrete Products Company. The plant runs from Fifteenth street to Sixteenth street and is also given over to the manufacture of ornamental standard lighting.

The concrete posts manufactured by the American Cement Products Company and its subsidiary organization are far superior to the old-fashioned iron posts, for, besides being the last word in up-to-date city lighting and beautifying, they neither rot, rust nor wear, neither do they require painting or repair, thus effecting a great saving that no community can afford to overlook. Concrete posts vastly improve the appearance of a city street and are being installed in all the leading cities and towns throughout southwestern California.

The company is now arranging and equipping its plant for the manufacturing of cement fence posts and sewer and irrigating pipe, another important branch of the industry, for, with the development of the country there is a constant and growing demand for this type of fence post. Aside from the natural and obvious advantages of concrete over iron posts, the rapidly increasing price of metals will soon make the iron post impractical and a thing of the past.

## Dry Wall Concrete Block Building

I give below a description of the only moisture-proof concrete structure I have so far seen, and I have examined several. The wall is two separate courses of brick with 2-inch space between, with No. 8 wire tie on each brick in every other course; brick was laid up in mortar mixed 1 part cement, 2½ parts sand, with just enough lime paste to toughen the mortar, which also makes it point up smoother. I have a wall which is absolutely frost and moisture proof, warm in winter and the coolest house in summer I have ever been in. The brick were made on a small hand-tamp machine and were mixed 1 part cement, 3 parts sand, graded from fine sand up to gravel that would pass ½-inch screen. I found by mixing kerosene as a mold wash, which can be quickly applied with a paint brush, I could use a wet mix.

After being properly cured for 4 weeks I dried same in an oven and placed them in water and the absorption was less than 3 per cent. I used 14 sacks of cement to 1000 brick.

A. E. Sallee, Mt. Moriah, Mo.

# Large Potash Recovery at Clinchfield Cement Plant

## Installation Approaching Completion Is Designed to Save Four and One-half Tons Daily—Will Lead All Cement Mills of the Country.

Construction work is now rapidly proceeding on the potash precipitation plant which the Clinchfield Portland Cement Corporation is installing at its mills in Kingsport, Tenn. This is the second southern cement company to install equipment to recover potash, and it is said that the Clinchfield plant will provide a larger output of potash than any other cement mill in the country.

The Clinchfield plant is designed to save about 4½ tons of potash per day.

This potash comes from the raw materials and is volatilized in the kilns, the hottest part of which is at a temperature of about 1400° C., and passes out of the stacks with the products of combustion. The principal source of potash is the shale used with the limestone for making cement, and it is estimated that by substituting feldspar in part for shale the potash can be considerably increased over the above figure. About 50 per cent to 60 per cent of the potash in the raw materials is volatilized and about 90 per cent of this can be recovered by the apparatus to be installed. The volatilization can be greatly increased by employing salt in the raw materials, so that by using some feldspar, which can easily be obtained here, and salt, the potash produced at this plant can probably be doubled over the present one. Incidentally, the equipment will also catch all dust now passing out of the stacks.

The system to be employed consists of the Cottrell or electrical precipitation process for catching dust and fumes. Included in the installation at this cement plant is a dry treater and a supplementary wet treater, together with apparatus for evaporation of the potash solutions obtained in the latter. A brief description of the plant is as follows:

The gases are led from the kilns by means of short flues into a large brick, concrete and steel flue at right angles to the latter. Dampers in the short flue and on the kiln stacks allow any kiln to be cut out of the system or operated independently of it at will.

The brick flue is connected to a Cottrell multiple pipe treater by means of a horizontal elevated steel flue. The top of the latter is composed of shallow pans in which the potash solution will be concentrated. The flue is provided with hopper bottoms and as all dust collected here is very low in potash, it is returned to the kilns.

The pipe treater catches most of the dust and some of the potash. It is of steel and terra-cotta and contains 320 pipes, each 16 feet long. The dust collecting here may be either returned to the kiln by conveyors or if high enough in potash may be sold for potash directly to fertilizer manufacturers or else the potash may be extracted and the dust returned to the kilns.

Draft for the kilns and for drawing the gases through the apparatus is provided by means of a fan which is interposed between the dry pipe treater and the wet treater. The latter is of concrete and consists of a novel departure in electrical precipitation worked out by the Western Precipitation Co., who control the Cottrell system for the cement industry. In this treater the gases will be made to pass in between two concrete walls, each of which is covered by a film of water constantly flowing over it. This water film acts as one electrode, and a number of wires spaced in between and equidistant from the two concrete surfaces acts as the other. The potash will be precipitated on the water film and goes into solution in this. There will be some dust deposited also, which is washed away with the water. The potash solution and suspended dust will flow out of the treater into concrete tanks, when the heavy dust will settle, after which the solution will be pumped back through the treater. As it becomes concentrated, due partly to solution of the potash deposited and partly to evaporation, it will be drawn off and fresh water added.

The strong potash solution so obtained will be pumped into clarifying tanks. The suspended dust will be allowed here to settle and washed by decantation, the washing water being sent to the treater. The potash solution will be concentrated largely in the pans over the flues and finished pans heated by direct fire located on the ground. The crystals are to be dried in a small rotary dryer, when they will be ready for the market. The potash salt obtained will consist largely of potassium and sodium sulphates and chlorides with a trace of sulphites.

The current used for precipitation is obtained from the main power plant of the company, where it is generated as 3 phase, 440 volts, 60 cycle A. C. This current is led to a rectifier-house, where it is transformed to single phase, 60 cycle, 75,000 volts, and is then passed through a mechanical rectifier, which gives a 75,000-volt unidirectional current for use in the treaters.

Work was started on the plant in December, but was held up both at Kingsport and at the steel fabrication shops due to the railroad embargoes of the winter. The plant was designed and is being built by Richard K. Meade & Co., Law Building, Baltimore, Md., and it is anticipated will be in operation Aug. 1.

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## Silent Chain Drives

Link-Belt Silent Chain, the efficient drive for machine tools, is described in book No. 312 of the Link-Belt Co., of Chicago. The success of the Link-Belt Silent Chain is due to the superiority of its joint construction. The segmental liners or bushings, which are removable, extend across the entire width of the chain, thus doubling the bearing surface and halving the bearing pressure on the joint.

The best grades of steel for the various parts of the chain, and the proper relative hardening and heat-treating, have been determined by many carefully-conducted experiments, supplemented by an extensive practical experience. The utmost care is exercised to secure uniformity and great accuracy in the chain parts.

Briefly, the facts to be remembered about Link-Belt Silent Chain are:

1. It is 98.2% efficient (on actual test).
2. Permits convenient location of driving parts.
3. Any reduction in speed is possible.
4. Uniformity of product.
5. Less wear and tear on cutting edges of tools.
6. Increase of production.
7. Economy of power.
8. Space saved.
9. Lowers first cost of motors, on account of large speed reduction possible.
10. Reduces horse power and cost of motor required.

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## President Acme Cement Co. Dies

William F. Beyer, Lancaster, Pa., lawyer and president of the Acme Cement Corporation, Catskill, N. Y., died recently of pneumonia after an illness of three days. He was 64 years old.

# A 1-Course Concrete Sidewalk and Its Cost

After having trouble for several years with 2-course concrete sidewalks the city officials of Bozeman, Mont., decided last spring to adopt 1-course construction. Information on this work was given by Mr. C. C. Widener, City Engineer, of Bozeman, in a letter to Concrete, from which we quote as follows:

The walks are 4½ in. thick. The mixture adopted for our work was 1:2:3½, with just enough water added to give the mass a jelly-like consistency. Our local gravel having just about run out, it was necessary to ship gravel from a pit 35 miles distant. This pit was half a mile from a railroad track, and as the amount we were to use was small it was decided to haul to the track, rather than extend the track. This, of course, increased the cost of the gravel. The freight rates were high and the final cost of the gravel on the job was $3.35 per cubic yard.

This gravel ran about 2 parts sand to 2½ parts rock or stone larger than ¼ in. As our mixture was a 2 part sand to 3½ parts stone mix, it was necessary to add about 1 cu. ft. of crushed gravel to 4 cu. ft. of the bank run gravel to secure the proper mix. Now I realize that it is against all the rules of the profession to use bank run gravel for good concrete, but my inspectors tested this gravel every hour of the run to keep a check on the bank run stuff, and continually it proved that 1 ft. of rock added to 4 ft. of the bank run would give us our desired mix. There were no screens at the pit and we were not able to get screened material of the quality and quantities desired, consequently we did the next best thing, and I believe our mix will check out in all instances to within 5 per cent of what was desired.

The crushed rock cost the contractor $2.60 per cubic yard on the job; gravel, $3.35. Cement cost the contractor $2.80 per barrel net on the job, labor was at a premium at $3.50 per day of 8 hours, and the finishers and form setters drew $5 per day of 8 hours.

Our construction differed very little from the ordinary sidewalk construction. Every 10 ft. of length of walk the walk was cut through to sub-grade for contraction or expansion joints (whichever you choose to call them). The concrete was tamped, floated and broomed. Immediately upon the walk assuming its initial set it was covered with canvas or burlap and this cloth kept damp until after the final set. Then the cloth was removed and the walk covered with about 2 in. of earth or sand, which was left on and kept damp for a period of 5 days.

To date we have yet to find a single crack in some 7,000 lin. ft. of 5-ft. walk, which was put in under these specifications. Of course, we do not know yet what the winter weather will do to it. All we can tell at the present time is that we had absolutely clean materials and that the walk went in according to specifications.

We kept fairly accurate cost data on this construction and the items are:

| | Per sq. ft. |
|---|---|
| Materials | $0.125 |
| Labor | .0475 |
| Bond | .0036 |
| Depreciation | .0100 |
| Discount | .0114 |
| Total | $0.1975 |

Contractor's bid was $0.228 per square foot.

The labor costs while seemingly high, are not so when you consider that there were 55 moves of outfit in placing the work. Also that at times it was necessary to pay $4 for labor and that the material was not always on the ground, thereby causing the straight time men to prove a burden.

# New Cement Tile Factory

Mason City, Iowa, has a valuable addition to its already famous industry of tile works in the new plant of the Cement Products Company. This new plant was instituted last May and is one of the four plants of this company. The other plants are located at Lanesboro, Spencer and Sac City. The chief products of the Mason City plant are drain tile and culvert pipes, the production running largely to the large sizes. Many of the contracts are upon large county drains. Sizes of the pipes range from twelve inches up to sixty inches and some larger upon special order. The capacity of this plant is 120 tons of concrete pipe daily, and Mr. Troxel, local manager states that the demand is taking all they can produce.


Indiana Steel Forms for Sidewalk Curb and Gutter and Curb Only

STEEL FORMS COSTLESS

It is sheer waste of time and materials to be continuously buying and cutting up perfectly good wooden materials for forms only to be thrown into the scrap pile after used a few times. Indiana Steel forms will stop this loss and enable you to retain your profits. You can do nicer and better work with steel forms. **Write today for new booklet.**

Automatic Sealing Vault Company, 216 E. River St., Peru, Indiana

# 125,000 Ton Blast

**Face: 600 ft. in length.** **Average depth of holes: 105 ft.**

**BATH PORTLAND CEMENT CO., BATH, PA.**

For Safety and Efficiency, the explosive charges were detonated with *Cordeau-Bickford* Detonating Fuse.

In a blast of this magnitude, consider the *amount* and *value* of the explosives used; add from 10% to 20% greater efficiency to your explosive by giving proper and complete detonation by means of Cordeau; add to this the safety features of Cordeau: and if you are not already using it, you will be interested in having a Cordeau booklet.

Cordeau is a necessity to the far-sighted quarry owner.

*Write for Cordeau booklet and Deep Well Blasting*

**The Ensign-Bickford Co., Simsbury, Conn.**

ORIGINAL MANUFACTURERS OF SAFETY FUSE ESTABLISHED 1836

## "Northwestern Cement Forms"

Recognized as standard by engineers, highway officials and all who work with cement. The right equipment to use when job must be quickly and economically done. Designed for every purpose and to meet every problem in making tile, culverts, drains, sewers, flumes, etc. Valuable information on cement and cement forms will be found in Bulletin 29. Mailed free.

**Northwestern Steel & Iron Works**

**Capital $200,000** **Eau Claire, Wisconsin**

## *Moderate in Price and with a Reputation for doing more than is claimed for them*

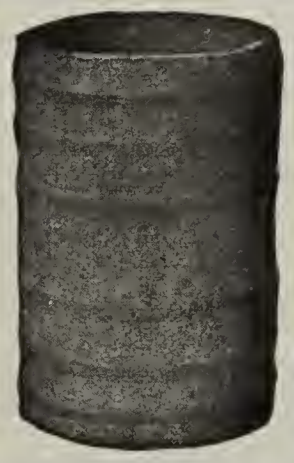
Jaeger Mixers **make** good because they are **made** good. No useless parts—no skimping. They are big enough for the big jobs and not **too** big to handle the little ones with profit.

And there's a Jaeger Mixer that just fits **your** needs. Let us tell you about it.

## The Jaeger Machine Company

212 Rich St.
Columbus,
Ohio

## The Biggest Tile Business on Record



Get action now. Big spring buying of drain tile will start soon—and it will be the biggest on record. Cement tile is needed wherever farming is done. Thousands more tile plants are needed to fill the demand.

Equipment must be selected and installed, manufacturing perfected, and a stock of tile made up—all within the next few weeks. Enlist our co-operation.

Dunn equipment is standard. It represents the minimum necessary investment, is sold on a strict guarantee to satisfy, and on 15 days' trial. Ask for the book, "Cement Drain Tile"; we send it free.

**W. E. DUNN MFG. CO.**

414 24th Street HOLLAND, MICH.

# BALLS

Forged steel balls of special analysis steel from 2" to 15" in diam. carried in stock. Can't be excelled.

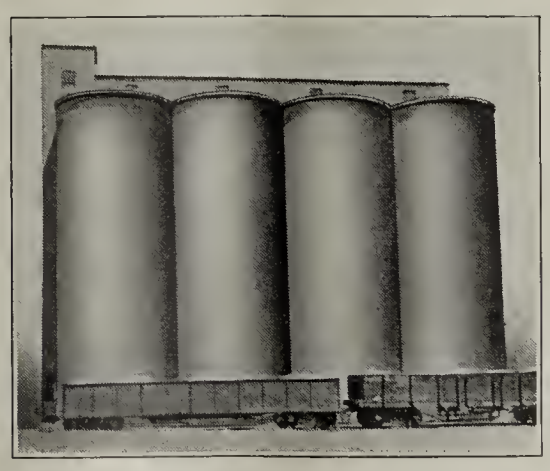
BALL MILL PLATES
CRUSHER SHAFTS
GRIFFIN MILL SHAFTS
GRIFFIN MILL CONVEX SEATS
GRIFFIN MILL CROSSHEADS
PIPE FLANGES
for High Pressure Work
STEAM SHOVEL, TRUCK AND CAR AXLES

**Hammer and Hydraulic Press Forgings of all kinds**

*We make quick service a feature of our business*

## TIOGA STEEL & IRON CO.

52nd AND GRAY'S AVENUE, PHILADELPHIA, PA.



## Eleven Bin Stock House

Erected for the
**Ft. Dodge Portland Cement Co.**
GILMORE CITY, IOWA

BUY MORE
**LIBERTY BONDS**

Let HOAG Build your Stock House

## D. F. HOAG & CO.

**Engineers and Builders**

**Corn Exchange - - MINNEAPOLIS**

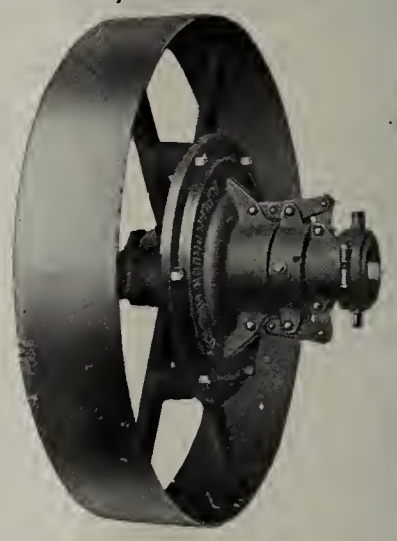
# LITTLE DAILY LEAKS OF POWER BOOSTS YOUR COAL BILL

The High Cost of Power Is Reduced to a Minimum By the Use of a

## Plamondon Disc Type Friction Clutch

The power of this clutch is unusual. The double toggles on this clutch develop such tremendous pressure that even on the largest clutches only a hand lever is needed to engage or disengage the clutch. The geared devices usually needed to operate large clutches are unnecessary.

This is only one of the practical advantages the cement mills find in this clutch. Write for our new catalog No. 59 and learn the rest of them.



WE ALSO MANUFACTURE GEARS

**A. Plamondon Mfg. Co.**

12-24 N. Clinton St. CHICAGO, ILL.

# Cut Gears

Spur,
Spiral,
Bevel and Worm
Steel and Rawhide

*Accuracy and Prompt Delivery*

When you want a gear cut you want it **quickly,**—we emphasize our promptness without sacrificing accuracy.

## Ganschow Cut Gears

stand first in accuracy—perfect mesh—silent operation and the quality that counts for long service.

*Estimates furnished from drawings and specifications.*
*WRITE FOR CATALOG.*

**WILLIAM GANSCHOW CO.**

1003 W. Washington St. - CHICAGO

# Everything in CUT GEARS

We have the largest and most modern equipped gear making plant in the west. Our gear making machinery embraces everything known that will in any way facilitate the manufacture of high-grade cut gears of all kinds up to 15 feet in diameter.

**Quick Deliveries, Low Prices and First Class Work Our Motto**

## Foote Bros. Gear & M. Co.

**210 to 220 N. Carpenter St., Chicago**

The
# KENT

A Specially Designed
## Mixer for Products Plants

Seventy per cent of the bigger block, tile, brick and specialty concrete products plants of the country use the famous Kent Mixer.

Equipped with automatic feeding device, it makes certain a proper proportioning of aggregates and being continuous in operation, it saves time and labor. The biggest concrete products plant in the world has found that four Kent machines will mix fast enough to keep its many tampers and mold machines busy.

**Write today for descriptive literature and prices.**

## THE KENT MACHINE CO.
Kent, Ohio

# IMMEDIATE DELIVERY
"Franklin"

ROUND—SQUARE—FLAT—SQUARE TWISTED
## STEEL BARS
for CONCRETE REINFORCEING

We can meet your Reinforcing Steel Requirements. This means not only quick shipment from the mills but co-operative service for rapid transportation. If you want to know just what your exact cost will be, send us the Blue Prints and we will give you a lump sum bid on all the steel sheared to lengths, bent to specifications and delivered to the job,

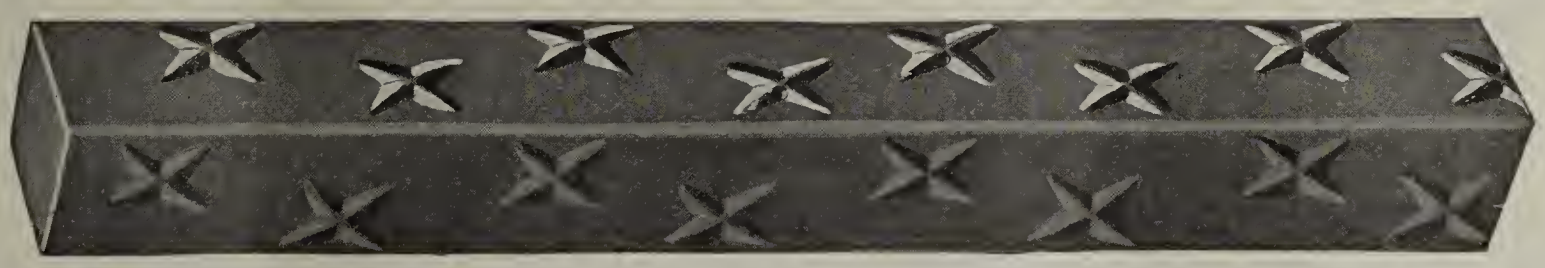
***Our Engineering Department is at your service.***

## The FRANKLIN STEEL WORKS
FRANKLIN, PENNA.

Cleveland, 1320 Rockefeller Bldg.
Boston, - - 12 Pearl Street
Philadelphia. 2215 Race Street
New York, - 30 Church Street
Chicago, - - 332 So. Michigan Blvd.
Buffallo, - Erie County Bank Bldg.
Pittsburgh, Oliver Bldg.

QUALITY SERVICE

# Inland Deformed Bars



In Open Hearth Steel (New Billet Stock), Hard Grade, and Rail Carbon Steel (Rerolled).

The mechanical bond is theoretically correct and is guaranteed by us, having been designed by expert concrete engineers and approved generally by engineers and architects.

The corners are rounded to prevent splitting of the concrete. Bending, fabricating and setting are easily done with these bars. Sizes ⅜ to 1¼ inch. Lengths up to 85 feet.

Prompt shipments during 1918.

## INLAND STEEL COMPANY First National Bank Bldg., CHICAGO

BECAUSE WE SPECIALIZE ON
## Lock Seam Pipe
with the smooth inside surface, having already furnished large quantities for Potash Recovery plants, we are able to give especially careful attention to the construction of this class of Pipe.

## Robertson Bros. Mfg. Co., Chicago

## DANIEL B. LUTEN
INDIANAPOLIS
*Designing and Consulting Engineer*
*Reinforced Concrete Bridges Exclusively*
Associate Engineers in each State

CALDWELL'S HELICOID

HELICOID Screw Conveyor is heavier, stronger and better made than any other. Requires fewer repairs —no lapped and riveted joints to come apart—flight all one piece. Special hangers, bearings and boxes for cement work. If you have anything to do with the manufacture of cement, you should write for our Catalogue.

Elevating, Conveying and Power Transmitting Machinery.

## H. W. CALDWELL & SON CO.
17th Street and Western Ave., CHICAGO
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# GOODRICH

# "LONGLIFE"

## CONVEYOR BELTS

are not "just as good" belts—they have never yet been classed with the "also rans."

"LONGLIFE" makes its own class and it's a mighty exclusive one. We continue to offer a free membership in this class to any other Conveyor Belt—rubber, canvas, Balata, or what not, with the proviso that it does as good, or better in service than "LONGLIFE."

The offer has been open a long time—without any takers.

They Know They Can't Beat

## "LONGLIFE"

**THE B.F. GOODRICH COMPANY**

Makers of the Celebrated Goodrich Automobile Tires—
*"Best in the Long Run"*

AKRON, OHIO
Representation Everywhere

**THE FULLER ENGINEERING COMPANY**

**Designing, Constructing and Operating Engineers**

**Cement and Hydrated Lime Plants a Specialty**

**Reports, Examinations and Analyses of Raw Materials for Cement Consultations Solicited**

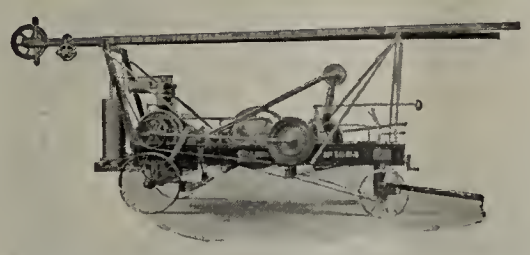
**Offices: Allentown National Bank Bldg.**
**ALLENTOWN, PA.**

**WATER** SOFTENING OR FILTRATION

FOR BOILER FEED AND ALL INDUSTRIAL USES

WM B. SCAIFE & SONS CO. PITTSBURGH, PA.

## A Big Blast-Hole Drill That's Reliable



### The Cyclone No. 14

Heavy, solidly braced frame — Sill timbers 4" x 14". All machinery placed directly on the main sills protecting it against strains and preventing top heaviness. **Eighty per cent (80%) of the castings are cast steel**—not cast iron. The Cyclone No. 14 is the only Blast-Hole drill so built. Furnished in Steam, Gasoline, Compressed Air or Electric Power; traction or non-traction.

**The Sanderson Cyclone Drill Co., Orrville, Ohio**

**Eastern and Export Office, 50 Church St., New York, N. Y.**

## MOLDS MOLDS MOLDS

**Complete Outfit for "Ornamental Concrete"**

Consisting of

**Iron and reinforced Composition Molds and Patterns as: Columns, Balusters, Balls and Bases, Pier Blocks, Roofing Finials, Pedestals, Sundials, Benches, Flower Vases, Flower Boxes, Jardinieres, Monuments, Tombstones, Friezes, etc.**

**BARGAIN** if taken immediately, on account of old age and sickness. May divide.

**HANS HIRSCH** CARONDELET and CLIO STS. **New Orleans, La.**

## WOULD YOU USE AN INTERMEDIATE SYSTEM FOR CONVEYING YOUR FINISHED GRAVEL FROM PLANT TO CAR IF YOU COULD SPOT THE CAR UNDER THE SPOUTS OF THE BIN?

Not If You Could Help It Would You?

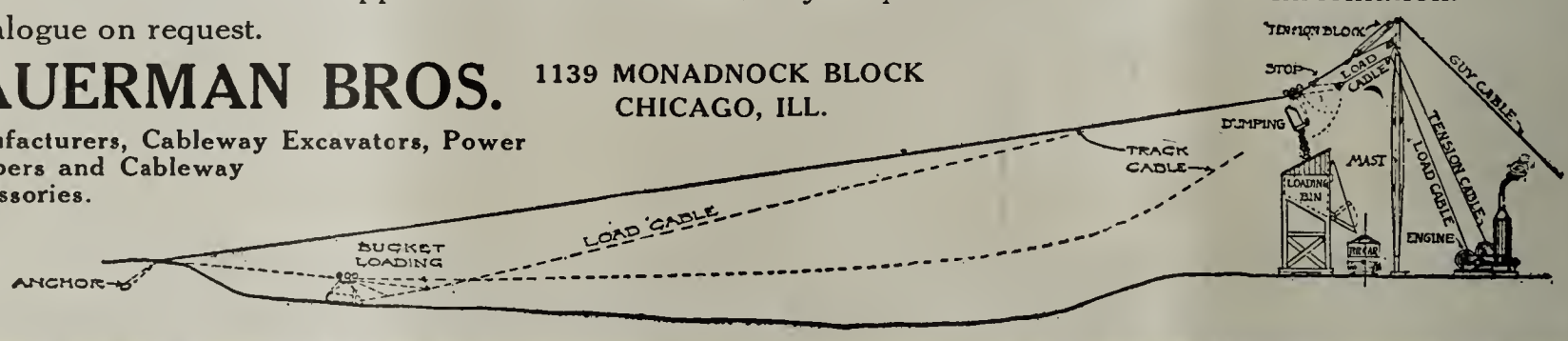
Then is it not just as logical to do away with an intermediate conveying system between **pit** and plant?

Are you using one machine for digging the material and another to convey it to the plant when you could just as well use one machine for the combined operation, saving the additional labor, machinery and upkeep cost?

The Sauerman Dragline Cableway Excavator is digger, conveyor and elevator combined in one.
It is the direct method from pit to plant.
It digs, conveys, elevates and dumps in one continuous forward operation.
Operated by a double drum friction hoist under one man control.
One Machine—One Operation—One Man Control
If you are interested in the application of this machine to your plant write us for further information.
Catalogue on request.

**SAUERMAN BROS.** 1139 MONADNOCK BLOCK CHICAGO, ILL.

**Manufacturers, Cableway Excavators, Power Scrapers and Cableway Accessories.**




# The Silo Business will come to you .... if you build CALDWELL SILOS

CALDWELL Silos practically sell themselves. They are storm-proof, water-proof, air-proof, acid-proof, fire-proof, vermin-proof — altogether, trouble-proof. Each stave is a wet mixed reinforced stave having $\frac{3}{8}$" bar of twisted steel placed diagonally in the concrete. And each stave interlocks with the six adjoining staves; is crossed and held in place by three external bands. Caldwell Silos are permanent, moderate priced and favorites with the farmers.

We have the most business-like silo proposition on the market for the man who will push these silos in your community. There is no territory to buy, no royalty to pay. We will start our representative "right." If you are interested in securing this business, write for full information NOW. Don't delay and let a neighbor get your territory.

**CO-OPERATIVE CONCRETE CONSTRUCTION COMPANY**
**OSKALOOSA IOWA**

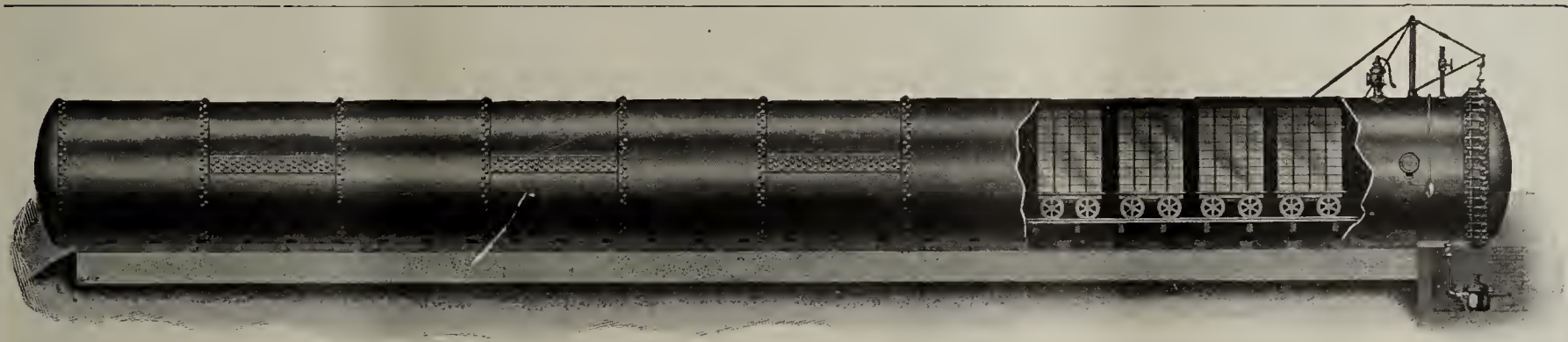
# Sand Lime Brick Machinery

Our complete line of Sand Lime Brick Machinery makes it possible to secure just that machinery which is required to make your plant a success. We favor no particular type of machinery but are guided by the needs of the customer. Our wet and dry grinding mills have transformed a number of unsuccessful plants into dividend producers, while our Presses, Mixers, Hardening Cylinders and other equipment are of equal quality. We can exactly meet the demands of any manufacturer with a quality of machinery which will operate at a profit with a minimum amount of attention and expense.

*Correspondence solicited*

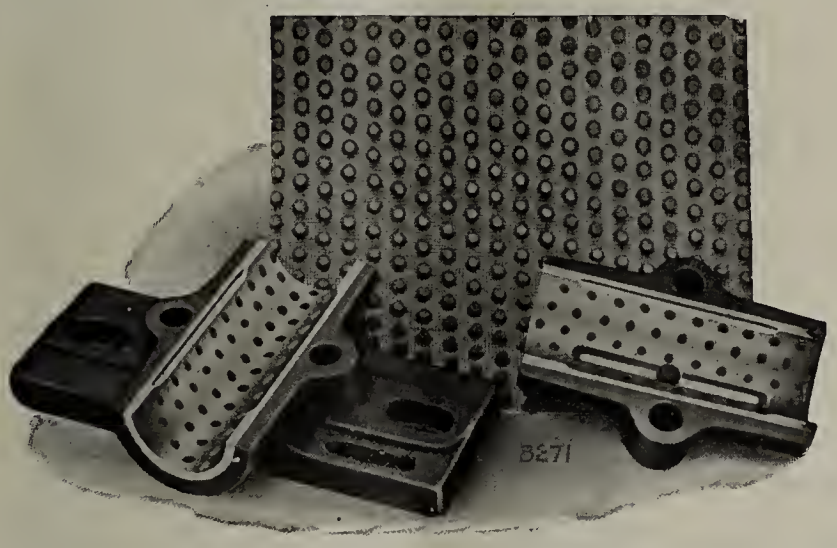
## The American Clay Machinery Co.

**WILLOUGHBY, OHIO**



# Eliminate Friction—Reduce Labor of Rebabbitting

**PREPARE YOURSELVES NOW** against the serious problems of labor and coal shortage. You must utilize all improved mechanical and lubricating devices as will increase your present production to the fullest extent.



## RANDALL GRAPHITE SHEET LUBRICATOR

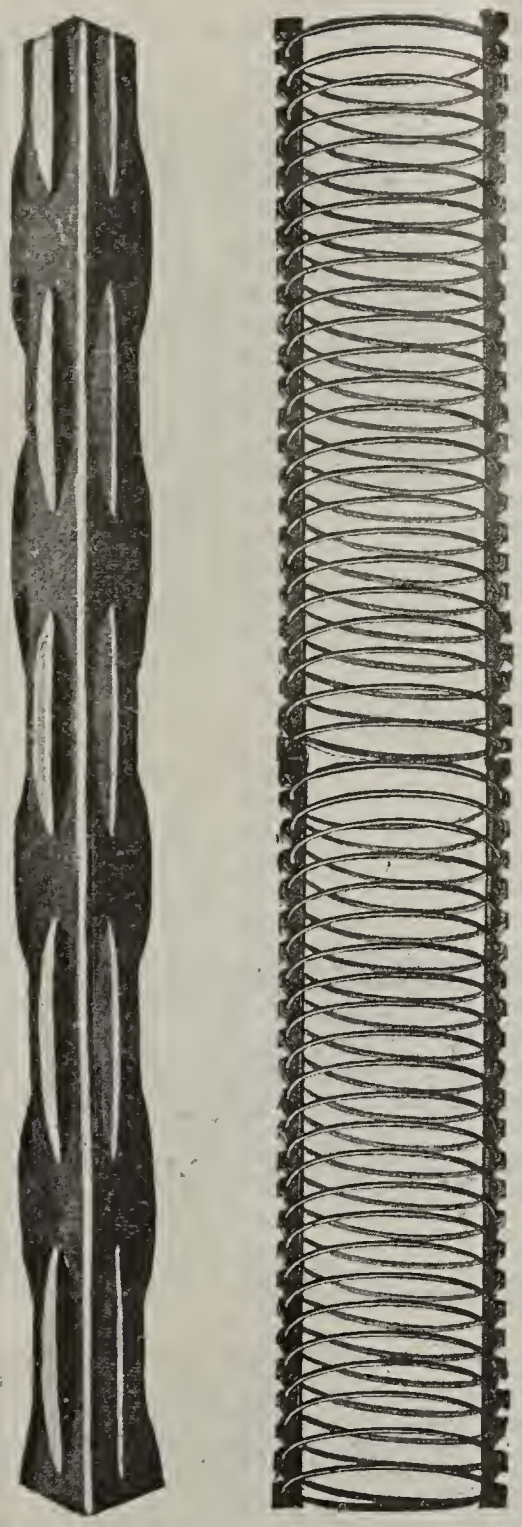
**Will increase the life of your Bearing 300 to 400 per cent**

It will enable your bearings to stand up under heavy pressure and high speed without heating, assuring an appreciable increase in operating efficiency with a substantial saving in operating cost. In addition to the economies of oil, babbitt metal, time and labor, the slight amount of oil required for bearings so equipped overcomes all oil soaking in the belt, and the saturating of the machinery with oil is also avoided. This simple device will displace sufficient bearing metal to pay for the cost of the lubricator.

***Write for circular, information and trial order plan***

## Randall Graphite Lubricator Co.

**816 W. LAKE ST., CHICAGO**



# STEEL BARS AND SPIRALS FOR REINFORCED CONCRETE CONSTRUCTION

# "Bars on the Job Ready for Your Men"

Delay, caused by the failure to have your reinforcing material on the job not only throws out your calculations but also the schedule of every other contractor on the job.

You can save the loss of much time and money by specifying Havemeyer Bars for your reinforced concrete work.

Their prompt service insures your having bars on the ground when the men go to work.

## HAVEMEYER BAR

Service insures direct shipments of reinforcing steel from our Chicago warehouse, which is located within easy teaming distance of the loop and makes delivery when material is needed.

Havemeyer Products, Bar-Tys, Bar-Spacers, Ty-Chairs, Beam-Saddles, Etc., keep the steel in its right place while the concrete is being poured.

*Try Our Service*

## CONCRETE STEEL CO.

MONADNOCK BLDG. CHICACO

# The story of HYDRATED LIME

## SHOOTING CONCRETE 4,000 FEET

Out at San Francisco the Twin Peaks Tunnel is being built by R. C. Storrie & Co. It passes through water bearing soil and City Engineer M. M. O'Shaughnessy specified Hydrated Lime in the concrete to make the structure waterproof, eight pounds of hydrate being used to one hundred pounds of cement; the concrete proportions being 1 cement, 2¼ sand and 5 crushed gravel, graded from ¼ to 1¼ inches.

R. C. Hackley, engineer for the contractor, writes:

"On this work the pneumatic concrete placing system is used and we have shot the concrete twenty-six hundred feet through eight-inch pipe and expect to extend this line to four thousand feet or more; the lime being a great help as a lubricant. Where chutes are used they can be much flatter and will carry the concrete much farther with lime in the mix; in fact we have used lime for this purpose and for easier placing in narrow walls and around reinforcement, even when not specified, on account of the labor saved.

"The uniformity of the concrete on this piece of work and the absence of honeycomb patches can be greatly attributed to the use of Hydrated Lime."

*Write any of the following competing manufacturers of Hydrated Lime for complete information about Hydrated Lime in Concrete.*

**Marblehead Lime Co.,**
Chicago—Kansas City

**Port Byron Lime Assn.,**
Port Byron, Ill.

**Tidewater Portland Cement Co.,**
Baltimore, Md.

**Lee Lime Co.,**
Lee, Mass.

**Glencoe Lime & Cement Co.**
St. Louis, Mo.

**Ste Genevieve Lime Co.**
St. Louis, Mo.

**Dutchess County Lime Co.,**
Dover Plains, N. Y.

**Palmer Lime & Cement Co.,**
103 Park Ave., New York, N. Y.

**Rockland & Rockport Lime Co.,**
New York—Rockland, Maine—Boston

**The A. & C. Lime Co.,**
Canton, Ohio.

**Kelley Island Lime & Transport Co.,** Cleveland, Ohio.

**National Lime & Stone Co.,**
Carey, Ohio.

**Ohio Hydrate & Supply Co.,**
Woodville, Ohio

**John D. Owens & Son Co.,**
Owens, Ohio.

**Woodville Lime & Cement Co.,**
Toledo, Ohio

**Merion Lime & Stone Co.,**
Norristown, Pa.

**Vermarco Lime Co.,**
West Rutland, Vt.

**Riverton Lime Co.,**
Riverton, Va.

## EXCEPTIONAL OPPORTUNITY

# Complete Cement Plant

## Capacity 750,000 Bbls. Annually

**LOCATION, BEDFORD, IND.**

We own and offer for sale the above plant and offer it either as a whole or in part. Quotations will be made on any parts desired. Buildings:

| | |
|---|---|
| Raw Material Building | 130x135 ft. |
| Raw Material Annex Building | 43x 90 ft. |
| Rotary Kiln Building | 95x180 ft. |
| Coal Drying and Grinding Bldg. | 58x 80 ft. |
| Dry Grinding Building | 90x114 ft. 5 in. |
| Storage Warehouse | 80x250 ft. |
| Boiler and Power House | 91x100 ft. |
| Repair Shop | 30x119 ft. |
| Coal Storage Building | 25x100 ft. |

All buildings structural steel with brick walls.

2—300 H.P. Cahall Vertical Water Tube Boilers.
4—250 H.P. Geary Water Tube Boilers.
1—375 H.P. Heine Boiler.
All 160-lb. pressure.
1—1000 K.W. Vertical General Electric-Curtis Turbo-Generating Set.
1—800 K.W. Vertical General Electric-Curtis Turbo-Generating Set.
Both sets 3 phase, 25 cycle, 480 volts; one complete switchboard panel for the above, also condenser for the turbines, circulating pumps—everything complete and now in position.
20—10-ton steel hopper dump cars.
2—Austin No. 6 Gyratory Late Type Crushers, with elevators, screen, etc.
1—60 in. x 50 ft. Moser Dryer.
2—60 in. x 40 ft. Sinker Davis Dryers.
1—Allis-Chalmers set of Anaconda Rolls, sizes 40x15 in.
3—5x22 ft. Gates Tube Mills.
32—30-in. Griffin Pulverizing Mills.
10—Allis-Chalmers Rotary Kilns, 7 ft. to 5 ft. 6 in. x 60 ft., complete with Automatic Kiln Feeder Boilers, coal pulverizing equipment, etc.

Besides the above, the plant is equipped with all the necessary conveyors for material, elevators, all copper wire for transmitting current, laboratory complete, office buildings, stone quarry, shale quarry, sidings, workmen buildings and approximately 325 acres of Real Estate.

*For Prices and Full Particulars Address*

**McCOY-BRANDT MACHINERY COMPANY**

**216-218 Penn Avenue, Pittsburgh, Pa.**

# BLACK GIANT STITCHED DOUBLE BELTING

THIRTY thousand feet of BLACK GIANT DOUBLE STITCHED BELTING in sizes ten to twenty-four inch eight ply furnished within the last sixty days to two of the largest cement plants in the United States. Both of these plants have used BLACK GIANT DOUBLE STITCHED BELTING for the past five years. BLACK GIANT DOUBLE STITCHED BELTING is the most improved cotton belting manufactured today and is adapted for all kinds of work wherever machinery is run, either for transmission of power, elevators or conveyors.

*Manufactured exclusively by*

**McIlroy Belting and Hose Co.**

**Hammond, Indiana, U. S. A.**



**BELTING**

"V-B" Balata
"AMPERE" (Canvas Stitched)
"WHITE SEAL"

Write for Prices, Discounts and Samples

**VICTOR BALATA & TEXTILE BELTING CO.**

Factory: Easton, Pa. Main Office: 38 Murray St., New York
Stores: 167 N. Market St., Chicago, and 87 High St., Boston

**CONVEYOR BELTS A SPECIALTY**

## For Sale

500 tons new O. H. 105 lb. NYC standard rails with splices.

1000 tons new O. H. 90 lb. ASCE rails with splices. Will quote on entire quantity or on such lots as required for prompt shipment.

**M. MITSHKUN CO.,**
**BOOK BUILDING**
**DETROIT, MICHIGAN**

## Scrap Cement Bags

We are in the market for an unlimited quantity of scrap cement bags. Write or wire prices, stating quantity and whether dusted or not.

**Clayton Shoddy & Cotton Mills**
**CLAYTON, N. J.**

One No. 4 March-Capron Concrete Mixer, without power, weight 7,000 lbs. Price 4c lb.

One Steel Cage, Hoppers, Wire Rope, etc., 5c lb.

One 5,000-lb. capacity two-drum Thomas Electric Hoist with 50 H.P. Motor; needs repair; $750.00.

One 28 H.P. Charter Gasoline Engine, $350.00.

**TEUSCHER & SON MCHY. SUP. CO.,**
**St. Louis, Mo.**

**FOR SALE**

## Rebuilt Machinery

**For Immediate Delivery**

1—16x32x42 Cross-Compound Murray Rolling Mill Corliss Engine, belt drive.
1—400′ Worthington Surface Condenser.
2—66″x16′ Tubular Boilers.
1—16x36 Double Eccentric Heavy-Duty Fulton Corliss Engine, belt drive.
1—14x20 Atlas Automatic Engine, belt drive.
1—40x60 No. 10 gauge Steel Stack.
1—36x70 No. 10 gauge Steel Stack.
1—5x7½ Vertical Throttling Engine.
1—Induced draft Fan, 60″ diameter, 30″ outlet—steam driven.
1—20x34x28 Tandem Compound Fitchburg Engine, direct connected to 300 KW. direct-current G. E. generator.
1—450 KW. G. E. Alternator, 2300 volts, 3 phase, 60 cycle, direct connected to E. P. Allis Cross Compound Engine; steam driven surface condenser with switchboard panel and instruments.
1—800 KW. G. E. Alternator, 2300 volts, 3 phase, 60 cycle, direct connected to McIntosh & Seymour horizontal heavy-duty engine, 100 RPM.
1—New 350 HP. IXL Open Feed Water Heater, purifier and receiver, with cut-out valve and oil separator.

**H. J. GEBHARDT**
**1421 FISHER BUILDING** **CHICAGO**

*New and Second Hand Bargains*

## CARLIN'S

**SHEARS DERRICKS**
**GRINDING PANS**
**ELECTRIC HOISTS**
**BUCKETS**

*Same location for 69 years*

**JOHN H. CARLIN MACHINE CO.**
140 Lacock St., N. S., Pittsburgh, Pa.

## For Sale by Owner

1—American Hoist Engine, 5½″x8″, D. C. D. D., with Sleuthing Attachment & Boiler.
1—No. 5 AUSTIN Gyratory Crusher.
600′ 1¼″ Plow Steel Cable.
1—INGERSOLL-RAND Air Compressor, Imperial type 10, Double Stage, 12x12 & 7½x12, capacity 327 Cubic Feet, direct connected to General Elec. 50 H. P. Motor with Auto Starter and including Receiver Tank and Automatic Unloader.
1—All Steel Derrick with Bull Wheel, and Interchangeable Boom for lengths 30′, 60′, 90′ and 110′.
1—General Elec. 50 H. P. Motor, A. C., 2 phase, 860 R. P. M.

**BETTENDORF STONE COMPANY**
**820 Kirkwood Blvd.** **Davenport, Iowa**

## 2-Yard Clam Shell Bucket

**McMyler-Interstate Class "M" Two line; weighs about 4600 lbs.**
**Condition Like New—Used But Thirty Days**
**$775.00 f.o.b. Chester, Pa.**
**Inquiries are solicited for Steam Shovels, Locomotives, Cars, Rails, Hoists, Derricks, Etc.**

**Wm. B. Grimshaw Co.**
**1052 Drexel Bldg., Philadelphia, Pa.**
**Dealers in**
**"Used" but not "Abused" Machinery**

## The Aero Pulverized Coal System

is a **Unit System.** The Pulverizer and the furnace is the unit. There is nothing between them but a plain iron pipe. Coal drying is optional.

The AERO is a no-storage system and therefore free from fire and explosion hazards.

The pulverizing, mixing and feeding operation, as well as the furnace, are at one time under the eye of one man. Write for Bulletin.

**AERO PULVERIZER CO., 120 Broadway, NEW YORK**

# READY FOR SHIPMENT

### LOCOMOTIVE CRANES

1—12-ton Orton and Steinbrenner, 8-wheel, M. C. B. 40-ft. boom, bucket drums.

### LOCOMOTIVES

2—Baldwin, standard gauge, saddle tanks; one 33-ton, the other 35-ton; cylinders of both 14x24; four driver type; Hunt's inspection certificate of approval furnished.
Baldwin, 7½ ton, 24-in. gauge, saddle tank.

### AIR COMPRESSORS

Ingersoll-Rand duplex, two-stage, steam driven, capacity 1,190 ft. air at 110 lbs. pressure.
1—Rand belt driven air compressor, capacity 300 ft. air at 100 lbs. pressure.

### CONCRETE MIXERS

2—Marsh-Capron ¾-yard, with steam engines and boilers mounted on wheels. Charging hoppers or side loaders.
1—Marsh-Capron 1 yard, mounted on steel skids (no power), charging hopper, electric or steam power can be applied.
1—No. 4 Smith with steam engine on skids.
1—Lot concrete spouting, size 14½" wide, 9¾" deep; hopper connections.

### CARS

4—1-yard capacity "V" shaped steel two-way dump, 30" gauge.
2—24" gauge Orenstein Arthur Koppel Dump Cars.

### BOILERS

4—200 H. P. (Heine type) water tube boilers.

### MINE HOISTS

Lambert, 10x12 double cylinder, single drum, 36-in. dia., 24-in. face. Drum grooved, will take up ⅞-in. cable. Drum flanges 8 in. deep. Link motion.
Brownhoist, 9x12 double cylinder, single drum, 48-in. dia., 36-in. face, friction type. Drum grooved for ⅝-in. dia. cable.

### DERRICK HOISTS

1—American 5½x8 double cylinder, double drum with boiler.
1—National 7x10 double cylinder, double drum, with boiler.
1—Flory, 7x10 double cylinder, double drum, with boiler.
2—Byers, 16 H. P. double cylinders, double drum, equipped with boilers and swinging gears.

### VULCAN HAMMER

1—No. 1 Vulcan steam pile hammer with McDermid base.

### WIRE ROPE

450 ft. ¾-in. (one piece) plow steel.
200 ft. ⅝-in. (one piece) plow steel.
312 ft. ⅝-in. (one piece) plow steel.
500 ft. ⅝-in. (one piece) plow steel.
850 ft. ⅝-in. (one piece) plow steel.
257 ft. ⅝-in. (one piece) plow steel.
850 ft. ⅝-in. (one piece) plow steel.

### PORTABLE TRACK

About 500 ft. of 20-lb. portable track and rails in 15-ft. sections.

## F. MAYER

**1601 Monadnock Building** **CHICAGO, LL.**

# BARGAINS
## Immediate Delivery

### HOISTS

8¼x10 in. Morrison, D.C., D.D.
7 x10 in. Stroudsburg, D.C., S.D.
9½x12 in. Lambert Cableway Engine

### ELECTRIC HOISTS

75 H.P. Flory, 3 drums and swinger, 440 volt, 60 cycle.
40 H.P. Lambert, D.D., 220 volt, D.C.
21 H.P. Lidgerwood, D.D., 550 volt, D.C.

### CRUSHERS

9x16 in. Climax.
10x22 in. Climax.
9x15 in. Champion
No. 5 Austin
Also several rotary screens

### BUCKETS

6—2½-yd. Lockwood bottom dump.

### COMPRESSORS

16x16x24x18 in. Ingersoll, 2 stage
10x 8x10x16x10 in. McKiernan, 2 stage
12x12x18 in. Laidlaw, straight line
12x12x12 in. Ingersoll, straight line
10x12x10 in. Ingersoll, straight line
16x10x10 in. Ingersoll, 2-stage, belt driven

**Also Pipe, Suction Hose, Etc.**

**WICKES MACHINERY CO.**
Claremont and West Side Aves.
Jersey City, N. J.

# For Sale—Immediate Delivery

***Owned By Us and Sold Under Absolute Guarantee***

### STEAM SHOVELS

1—95-C Bucyrus, shop number 1302.
5—70-C Bucyrus, shop numbers 1474, 1351, 1126, 1287, 1245, 2½-yd. dippers.
2—Standard 70-ton Bucyrus, shop numbers 733 and 572, 2½-yd. dipper.
2—45-C Bucyrus, shop numbers 1297, 1202; 1½-yd. dippers.
1—Model 60 Marion, shop number 1685.
1—85-C Bucyrus, shop number 1647, 4-yd. dipper.

### DRAG LINES

1—No. 2 Monighan and one Lidgerwood, on skids and rollers. 60-ft. boom, 2-yd. buckets.
1—Class 24 Bucyrus dragline on skids and rollers, 100-ft. boom, 3½-yd. bucket, equipped with elcctric light plant, also two extra buckets and a large amount of extra parts.
1—No. 1 Monighan all steel gasoline machine, mounted on walking device, equipped with 40-ft. boom and 1-yd. Page bucket.

### DUMP CARS

20—16-yd. standard gage Western air dump cars, with steel lined floors.
50—12-yd. standard gage, Western air dump.
15—12-yd. standard gage Oliver air dump.
100—3-yd. and 4-yd., 36-in. gage Western cars.
30—1½-yd., 24-in. gage.
7—Heavy duty, 4-yd. Western, 36-in. gage dump cars.

### LOCOMOTIVES

1—17x24 10-wheel Baldwin; Driving wheel centers 50"; driving wheel base, 13' 10"; weight on drivers, 84,000 lbs.; total weight, 164,000 lbs.; steam pressure, 180 lbs. Overhauled October 1, 1917. First class condition.
1—6-wheel 17x24 Big Four Switcher, with 8-wheel tender; weight on drivers, 87,200 lbs.; steam pressure, 140 lbs.; wheel base, 13' 8"; tractive force, 16,200 lbs. Now being overhauled. Ready for delivery 10 days.
1—16x24 4-wheel Davenport Switcher, with 8-wheel tender. Weight on drivers, exclusive of tender, 37 tons—47½ tons including tender. New in 1914. Has seen very little service.
1—11x16 cylinder 21-ton standard gage Davenport saddle tank locomotive. New in 1912. Westinghouse air brakes, automatic couplers, steam pressure, 165 lbs.
2—11x16 cylinder, 36" gage, Davenport saddle tank dinkies, practically new.
1—10x16 cylinder 18-ton standard gage Davenport saddle tank locomotive; automatic couplers, steam brakes, steam pressure, 145 lbs.
1—16x22 4-wheel switcher, C. M. & St. P., J-2 class, weight, 32 tons.
1—18x26, 8-wheel passenger type locomotive, Schenectady build; total weight, 51 tons; weight on drivers, 33 tons.
5—36-in. gage, 10x16 and 9x14 Davenport saddle tank locomotives.
2—7x12 in., 24-in. gage Davenport, shop number in the twelve hundred.

### REVOLVING TRACTION SHOVELS

1—25B Bucyrus traction shovel, shop number 1850, 1¼-yd. dipper; also special long dipper arm and ⅞-yd. dipper in addition to the standard equipment.

### RAIL, SWITCHES, SPIKES, ETC.

30—Complete switches for 60-lb., 70-lb. and 75-lb. rail, complete with target switch-stands, frogs, points, etc.
1—Carload 4½", 5" and 5½" spikes.
10 tons angle bars for 70-lb. and 75-lb. rail.
100 tons 52-lb. rail.

### SPREADER CARS

1—Standard Western spreader, almost new.
1—Standard, all-steel Jordan air spreader.

### SHOP EQUIPMENT

3—Brownell, 72"x18', Horizontal Tubular Boilers, with 4" tubes.
2—20x22¼x14¼x21 AA2 Ingersoll-Rand Compressors, complete with fittings.
1—20x22¼x15¼x21 AA1 Ingersoll-Rand Compressor.
1—66x18 Vertical air receiver, complete.
1—30x6 Vertical air receiver, complete.
1—16x16x18-in. Laidlaw-Dunn-Gordon Air Compressor with reservoir, weight 15,000 lbs.
1—Tire Lathe, 52-in. Swing, complete with countershaft.
1—Stationary Engine; horizontal center crank type; 10x12-in. cylinder, slide valve type; 25 H. P.

## CLAPP, NORSTROM & RILEY EQUIPMENT CO.

**12 and 14 South Canal St., Chicago** **Northwestern Branch: 1308 Pioneer Bldg., St. Paul, Minn.**

## Immediate Delivery

2—No. 6 McCully Gyratory Crushers equipped with manganese steel head and concaves and heavy duty shaft, standard discharge 12″ x 44″ feed openings, 34 x 16 driving pulley, weight 48,000 lbs. each, complete. Capacity 50 tons 2″ stone an hour; 120 tons 4½″ stone an hour. Bought in 1916, used only one month, excellent condition.

1—Patnoe Steel Chain Elevator complete on wood frame with geared head and driving pulley, 35′ centers, 53 elevator buckets 42″ x 19″. Bought in 1916.

1—No. 8 Geared Head Elevator complete on wood frame with 32″ 8-ply belt, 69′ centers, 105 elevator buckets 30″ x 17″. Bought in 1916.

1—Thomas 3-drum Electric Hoist equipped with latest improved boom swinging attachment with 150 H.P. A.C. Wagner motor 514 R.P.M.

1—10 x12 Chicago Pneumatic Tool Co. Air Compressor, Style GCSC, 11 x 18 x 16½, belt drive with horizontal Air Receiver 4½ x 11½, 500 cu. ft. per minute.

OSCAR DANIELS CO.
First National Bank Bldg,
Chicago



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| H.P. | | Speed |
|---|---|---|
| 1— 3 | —General Electric | 1800 |
| 1— 3 | —Westinghouse | 1200 |
| 1— 5 | —Wagner | 1800 |
| 1— 5 | —Allis Chalmers | 1200 |
| 1— 7½ | —General Electric | 1800 |
| 1—10 | —Westinghouse | 900 |
| 2—15 | —Westinghouse, Type CCL | 1750 |
| 2—15 | —Watson, slip-ring, var. speed | 1720 |
| 1—15 | —Fairbanks-Morse | 1200 |
| 1—15 | —General Electric, Form L | 1200 |
| 1—15 | —General Electric | 1200 |
| 3—15 | —Fairbanks-Morse, slip-ring, constant speed | 1200 |
| 1—15 | —Westinghouse, vertical | 1135 |
| 2—15 | —Allis-Chalmers | 1130 |
| 2—15 | —Allis-Chalmers | 860 |
| 2—15 | —Westinghouse | 850 |
| 4—20 | —Westinghouse | 1750 |
| 1—20 | —General Electric | 1200 |

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Capital and Surplus, $500,000.00


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### WANTED

Second-hand Smidth Kominuters and Tubemills. Quote price, description, location. Address P. O. Box 1941, New York, N. Y.


### COMPRESSORS

| | Price |
|---|---|
| 1—12x12 Laidlaw-Dunn Gordon, belt driven, capacity 300′ | $ 750 |
| 1—12x12x16 Ingersoll, straight line, steam driven, capacity about 300′ at 80 to 100 lb | 600 |
| 1—Sullivan, 2 stage air, simple steam, capacity 1800′ at 80 to 100 lb | 2,500 |
| 2—14x12 Bury Duplex, belt driven, capacity about 550′ at 60 to 80 lb., each | 1,000 |
| 1—14x16x10x16 Sullivan, 2 stage air, simple steam, capacity 600′ at 80 to 100 lb | 1,500 |
| 1—14x9x10 Bury, 2 stage, belt driven, capacity 350′ | 1,500 |
| 1—Ingersoll-Rand Imperial Type XB2, 500′ | 2,000 |
| 1—Sullivan 2 stage, belt driven, 1400′ good as new, f. o. b. St. Louis | 4,500 |

### CARS

| | |
|---|---|
| 20—4 yd. Western, 2 way, contractors, 36″ gauge, wooden bodies, each | $ 125 |
| 70—2½ yd. steel bodied, end dump quarry cars, 36″ gauge, each | 80 |
| 30—2½ yd. steel bodied, end dump quarry cars, 48″ gauge, each | 75 |
| 20—12 yd. Western, standard gauge MCB, air dump cars, almost new, each | 1,050 |
| 20—12 yd. Western, standard gauge MCB, air dump cars, good condition, each | 900 |
| 50—1½ yd. Koppel "V"-shaped, 24″ gauge, steel cars, new, each | 120 |

### CRUSHERS

| | |
|---|---|
| 1—No. 9 Style "K," almost new | $7,000 |
| 2—No. 5 Austins, one straight and one angle drive, both fine condition, each | 1,500 |
| 1—No. 6 Style "D" Gates, fine condition | 2,000 |
| 1—No. 7½ Austin, almost new | 2,500 |
| 1—10x20 Blake jaw crusher on skids | 800 |
| 1—9x16 Good Roads Machinery, jaw crusher on wheels, with 22′ elevator. | 800 |
| 1—9x16 Universal on skids, almost new. | 500 |
| 1—No. 7½ McCully | 3,000 |
| 1—No. 5 McCully | 1,500 |

### ELEVATOR AND SCREENS

| | |
|---|---|
| 1—No. 5 Gates 70′ centers, almost new. | $ 700 |
| 1—No. 7½ Austin 62′ centers, fine condition | 900 |
| 1—No. 9 with 36″ buckets, good condition, without belt | 900 |
| 1—Stephens & Adamson stone screen, 42″x16′, with dust jacket, practically new | 700 |
| 1—48x18 Austin screen with dust jacket | 800 |
| 1—48x20 McCully screen with dust jacket | 900 |

### CLAM SHELL BUCKETS

| | |
|---|---|
| 1—¾ yd. Owen with teeth, almost new | $450 |
| 1—1½ yd. Hayward, first class | 650 |
| 1—1 yd. Browning | 500 |
| 1—1½ yd. Page Dragline | 500 |

### CRANES

| | |
|---|---|
| 1—7 ton, 4 wheel Vulcan Bucyrus single line crane | $ 6,000 |
| 1—10-ton Browning 4 wheeled, with bucket | 7,000 |
| 1—15 ton Brown hoist, with 50′ boom, 8 wheeled MCB, with 2 yd. Brown hoist, clamshell | 17,500 |
| 1—20 ton Brown hoist, 8 wheel MCB, 50′ boom, and bucket | 18,000 |
| 1—25 ton Browning hoist, 8 wheel MCB, 50′ boom, and bucket | 21,000 |

### HOISTING ENGINE

| | |
|---|---|
| 1—6¼x10 American DCDD, with boiler. | $1,000 |
| 1—7x10 Lidgerwood DCDD, with boiler | 1,100 |
| 1—7x10 Lambert, 3 drum, with boiler | 1,600 |
| 1—8x12 Mundy DCDD, with boiler | 1,300 |
| 1—9x10 Lidgerwood, 3 drum, 32″ drums, without boiler | 1,900 |
| With boiler | 2,300 |
| 1—Clyde 9x10, 3 drum with boiler, f. o. b. Mich. | 2,500 |
| 1—5x8 DCDD Reversible O&S, with vertical engine, without boiler | 350 |
| With boiler | 550 |
| 1—7x10 Lambert DCDD, with boiler | 1,100 |

### LOCOMOTIVES

| | |
|---|---|
| 1—9x14 Vulcan, 36″ gauge, saddle tank. | $1,250 |
| 1—9x14 Vulcan 36″ gauge, saddle tank. | 1,350 |
| 1—10x16 Vulcan 36″ gauge, saddle tank. | 1,600 |
| 1—10x16 American 36″ gauge, saddle tank, good as new | 1,850 |
| 1—19x24 Baldwin, 10 wheeler, 60 tons. | 8,000 |
| 1—18x24 American, 10 wheeler | 5,000 |
| 1—17x24 6 wheel switcher | 5,000 |
| 1—14x24 Pittsburgh, saddle tank standard gauge with separate tender | 4,000 |

### DRAGLINES

| | |
|---|---|
| 1—Monighan-Walker steam machine, with 50′ boom, 1½ yd. bucket, almost new | $7,000 |
| 1—Flory outfit engine 10x12 heavy dragline type boiler, fire box 150 lb. pressure, boom 60′, steel bucket, 2 yd. New 1917 | 9,000 |
| 1—24 Bucyrus, with 85′ boom | |

### RAIL

| | Price |
|---|---|
| 400 tons—35 lb., with angle bars | $57 |
| 1500 tons—56 lb., with angle bars | 58 |
| 100 tons—75 lb., with angle bars | 55 |

### PUMPS

| | |
|---|---|
| 1—10″ Morris, sand, belt drive | $ 500 |
| 1—8″ Morris, water, belt drive | 300 |
| 1—20x10x14 Worthington duplex | 600 |
| 1—Wilson-Snyder water works pump, complete with condenser | 2,000 |

### STEAM SHOVELS

| | |
|---|---|
| 1—No. 0 Thew on standard gauge railroad truck, ⅝ yd. dipper | $2,500 |
| 1—No. 0 Thew traction with ⅝ yd. dipper, fine condition | 4,000 |
| 1—14B Bucyrus traction with ⅝ yd. dipper, almost new | 4,000 |
| 1—18B Osgood traction with ¾ yd. dipper, high boom, one year old | 5,000 |
| 1—No. 1 Vulcan revolving shovel, standard gauge with ¾ yd. dipper, good as new | 4,500 |
| Same as above, with 35′ crane boom | 5,500 |
| 1—45 ton Bucyrus, standard gauge, 1¾ yd. dipper | 6,500 |
| 1—Model 60 Marion with 2½ yd. dipper | 7,000 |
| 1—65 ton Bucyrus with 2½-yd. dipper | 5,000 |

### CABLEWAYS

| | |
|---|---|
| 1—9x10 Lidgerwood, 3 drum engine and boiler and carriage and part of other fittings, no rope | $3,000 |
| 1—50 hp. Flory DD electric with carriage and fittings, but no rope | 3,000 |
| 1—7x10 Flory steam DCDD with boiler, carriage and all fittings, but no rope | 1,950 |

### BOILERS

| | |
|---|---|
| 1—25 hp. vertical American hoist and derrick | $250 |
| 1—40 hp. firebox on steel truck | 550 |
| 1—50 hp. vertical butt strap | 750 |
| 1—60 hp. vertical Lidgerwood | 800 |

### MOTORS

| | |
|---|---|
| 1—20 hp. Westinghouse, 60 cycle, 3 phase, 220 volt | $400 |
| 1—30 hp. Westinghouse, 60 cycle 3 phase, 2200 volt | 450 |
| 1—35 hp. Westinghouse, 60 cycle 3 phase, 2200 volt | 500 |
| 1—50 hp. General Electric, 60 cycle 3 phase, 220 volt | 750 |

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1—**20 hp. Reeves Engine.**
2—**Western Elevating Graders.**
25—**Western 1½ yd. Dump Wagons.**
2—**No. 16 Koehring Concrete Mixer,** steam driven, traction, paving type, with boom and bucket.
1—**½ yd. Austin Cube Concrete Mixers,** steam driven, traction, paving type, with boom, bucket.
1—**5 ft. Fairbanks,** gas driven, low charging, **Concrete Mixer.**
**7992 lin. ft. Heltzel Pat. Steel Forms,** 6 in. high.
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6—**No. 3 Drags, Westerns.**
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1—**2 Horse Western Plow.**
1—**24 in. Disc.**
1—**2 Horse Steel Jno. Deere Plow.**
2—**Western Rooters, No. 20.**
1—**Western Rooter, Giant.**
43—**Western Dump Cars,** steel frame, 24 ga., 1½ yd.
14—**Western Dump Cars,** wood frame. 24 ga., 1½ yd.
3—**Brick Wagons.**
3—**Sterling Trucks,** 2½ ton, Steel Dump Bodies, Wood Hoist, 2 months' use.
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The above equipment is located in Illinois, and at Granite City, Illinois, and St. Louis, Mo.
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Terms: Sight draft attached to bill of lading or terms on approved credit.
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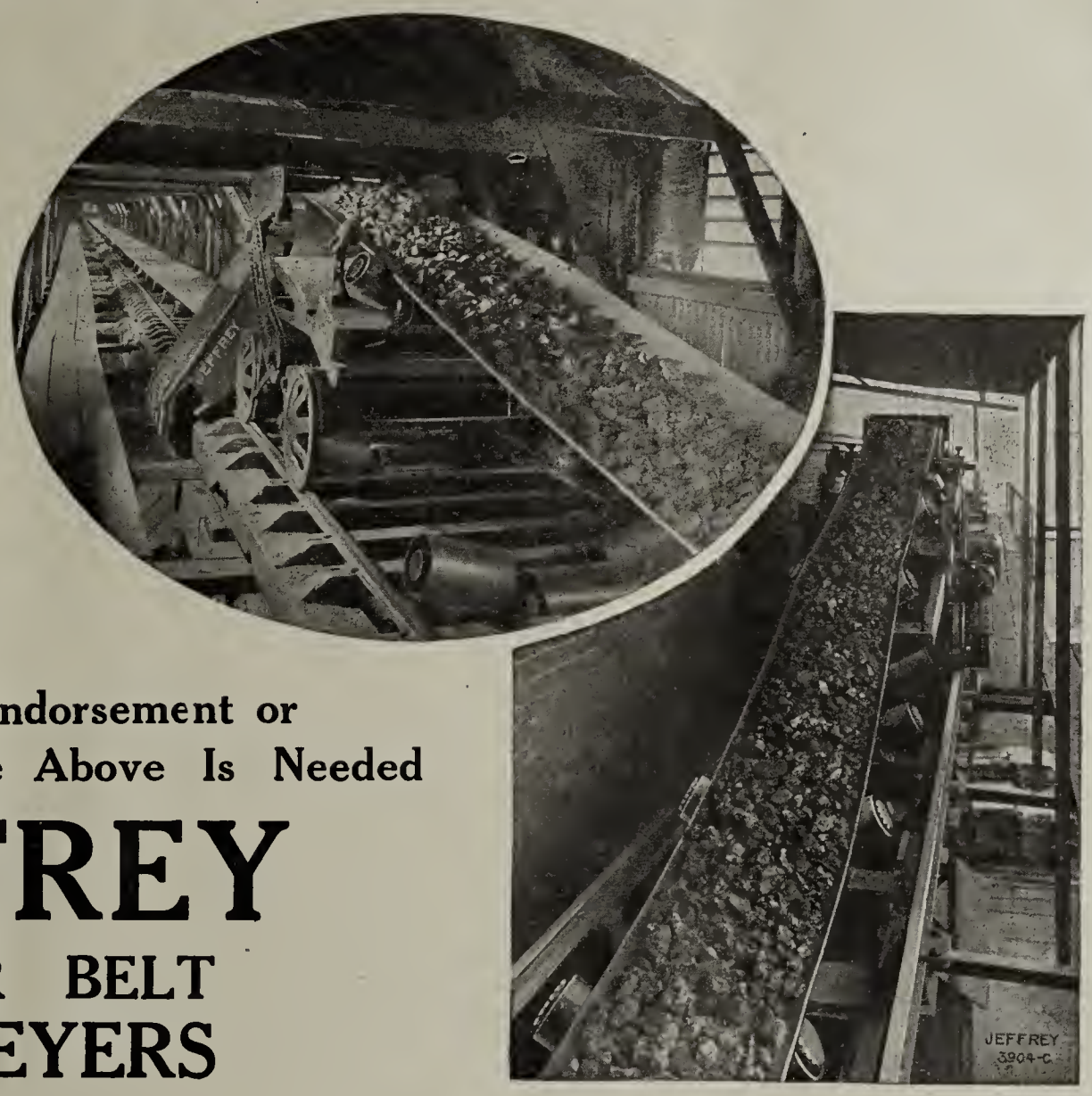


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Long or Short Transfer Conveyers can be readily made from Jeffrey Sectional Belt Units mounted upon castors and arranged in tandem, at various angles to the horizontal.

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# CEMENT AND ENGINEERING NEWS

with which Gravel & Stone Magazine is incorporated

(PUBLISHED MONTHLY)

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CHICAGO, AUGUST, 1918



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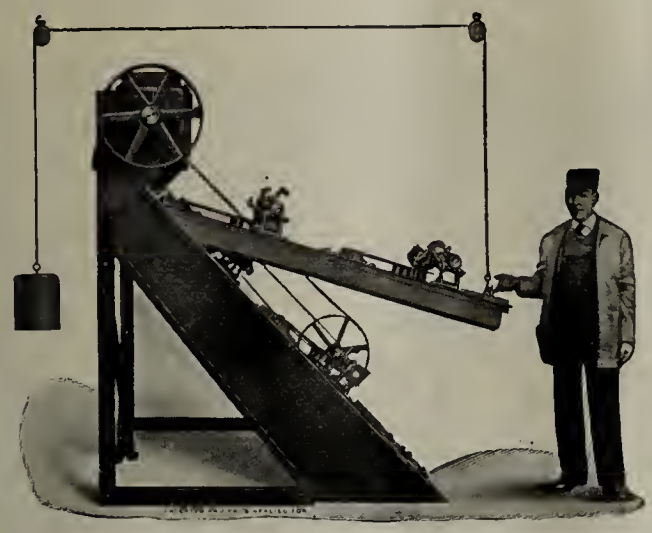

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Each Unit has screens 6x3 ft. and is a complete Separator in itself. Each part is interchangeable and of the most efficient size for vibrating, capacity, handling, repair, etc. By simply bolting units together a Separator of any reasonable capacity is obtained.

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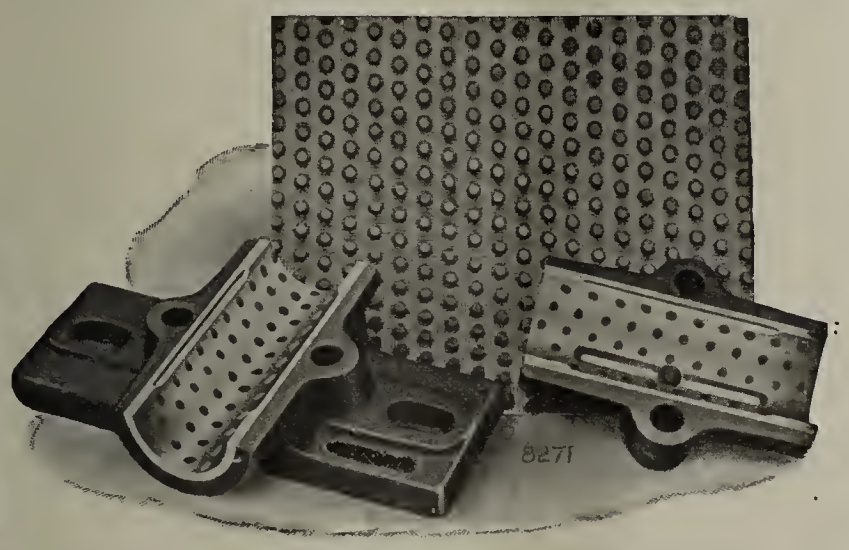
The vibration is really wonderful and yet nothing comes in contact with the wire cloth except the material being screened. This cloth is stretched taut and held taut and the tension may be regulated locally or in its entirety. Hammers jar elastic bridges far above the screen cloth which transforms these shocks into high pitched vibration when transferred to the wire clothing. The Scalper is also vibrated.

SEND FOR NEW CIRCULAR No. 77.

**STURTEVANT MILL COMPANY, BOSTON, MASSACHUSETTS**

# Eliminate Friction—Reduce Labor of Rebabbitting

**PREPARE YOURSELVES NOW** against the serious problems of labor and coal shortage. You must utilize all improved mechanical and lubricating devices as will increase your present production to the fullest extent.



## RANDALL GRAPHITE SHEET LUBRICATOR

**Will increase the life of your Bearing 300 to 400 per cent**

It will enable your bearings to stand up under heavy pressure and high speed without heating, assuring an appreciable increase in operating efficiency with a substantial saving in operating cost. In addition to the economies of oil, babbitt metal, time and labor, the slight amount of oil required for bearings so equipped overcomes all oil soaking in the belt, and the saturating of the machinery with oil is also avoided. This simple device will displace sufficient bearing metal to pay for the cost of the lubricator.

***Write for circular, information and trial order plan***

## Randall Graphite Lubricator Co.

816 W. LAKE ST., CHICAGO

# BIG MONEY

comes to the man who is well equipped to build monolithic concrete grain tanks, coal pockets, water towers and silos. No man is well equipped to do all this unless he has a **Polk System** machine. Write today for your copy of our catalog.

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**210 to 214 South Fourth Street, ST. LOUIS, MO.**

We make a specialty of supplying cement works with

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**Pyrometers, Calorimeters**

**High Grade Goods Only**

*Satisfaction Guaranteed*

*The Seal of Dependable Performance*

ACME THE TRUCK OF PROVED UNITS

*Trade Mark Reg. U. S. Pat. Off.*

# The Mighty ACME Truck Saves Money, Time, Man-Power

Haulage is a decidedly vital factor in the gravel and stone business. Constant truck service at low fixed cost is extremely important.

Constant truck service—at lowest fixed cost—is Acme Truck Service. Comparative figures show Acme leadership, both in economy and performance.

Acme quick loading and unloading features—plus Acme proved units—mean the utmost in service to the gravel and stone industry. They mean big saving, too, in money, time and man-power.

## ACME Proved Units Are Combined Perfections

The master products of sixteen master manufacturers are built into the Acme Truck. Acme proved units are combined perfections. Each stands for supremacy.

**HELP WIN THE WAR**
*Relieve the Railroads*
**Reduce your delivery costs and end delay with the ACME in your service**

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THIS valuable book is crowded with facts and figures of interest to every man in whose business haulage is a problem. It's titled "Pointers to Profits"—a valuable guide book to delivery profits. Write on your letterhead for a copy.

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Centrifugal Type Governor

## Acme Motor Truck Co.

74 Mitchell Street Cadillac, Mich.

*One-ton to Four-ton Models. Each oversized in both capacity and dimensions.*

The "rule of thumb" is not known in the ATLAS organization. There is no guesswork (sometimes called "judgment") in making ATLAS explosives. In making a proper explosive for each individual blasting requirement, scientific accuracy is necessary in every step.

That is why ATLAS has its own completely equipped Chemical Division, working in conjunction with every other department.

Our tests in each stage of production guarantee every pound as to its strength, uniformity and dependability.

# Prompt—Practical—Personal Service

Day and night our corps of chemists is working in your interest.

But this is a mere incident in our program to increase the efficiency and lower the cost of blasting in all its phases and under every condition—a program best described by the one word, "SERVICE."

Many engineers who are continually confronted with new blasting problems always put them up to us. One writes "ATLAS gives what I call 'THREE-P' service—Prompt, Practical, Personal."

We invite every man interested in blasting to test ATLAS Service for the three P's.

We have the benefit of more than a century's experience in making and using explosives. In ATLAS Service, this experience is put to work for explosive consumers.

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**Sales Offices: Allentown (Pa.), Birmingham (Ala.), Boston, Chicago, Des Moines, Houghton (Mich.), Joplin (Mo.), Kansas City, Knoxville, McAlester (Okla), Nashville, New Orleans, New York, Philadelphia, Pittsburg (Kan.), Pittsburgh (Pa.), Pottsville (Pa.), St. Louis, Wilkes-Barre (Pa.).**

**A PROPER EXPLOSIVE FOR EVERY BLASTING REQUIREMENT**

**Put your blasting problems up to us**

Our Service Department is a clearing house of blasting experience in all its phases and under all conditions. It is directed by experts who will personally help you apply this vast store of information to *your own blasting.* WRITE TODAY.

# A MODERN PLANT EQUIPPED WITH A MODERN CRUSHER

THE size and capacity of the large sand and gravel crushing and washing plant of the Akron Gravel and Stone Co., Akron, Ohio, illustrated above, exceed any other land operated plant so far constructed. The daily 10-hour capacity is 100 cars of crushed and washed material. This modern, electrically operated plant is equipped with a 48-inch Symons Disc Crusher.

Equip **your** plant with a Symons Disc Crusher. It will increase your output, lower your cost and deliver a more uniform material. The Symons Crusher is unexcelled for secondary crushing or to replace Gyratory crushers up to No. 7 1/2. It is also economical in plants where the feed is not over 6 1/2 for use as an initial breaker.

Records made by the Symons Disc Crusher in plants of large gravel producers attest their superiority for low maintenance and operating expense. They are made in four sizes.

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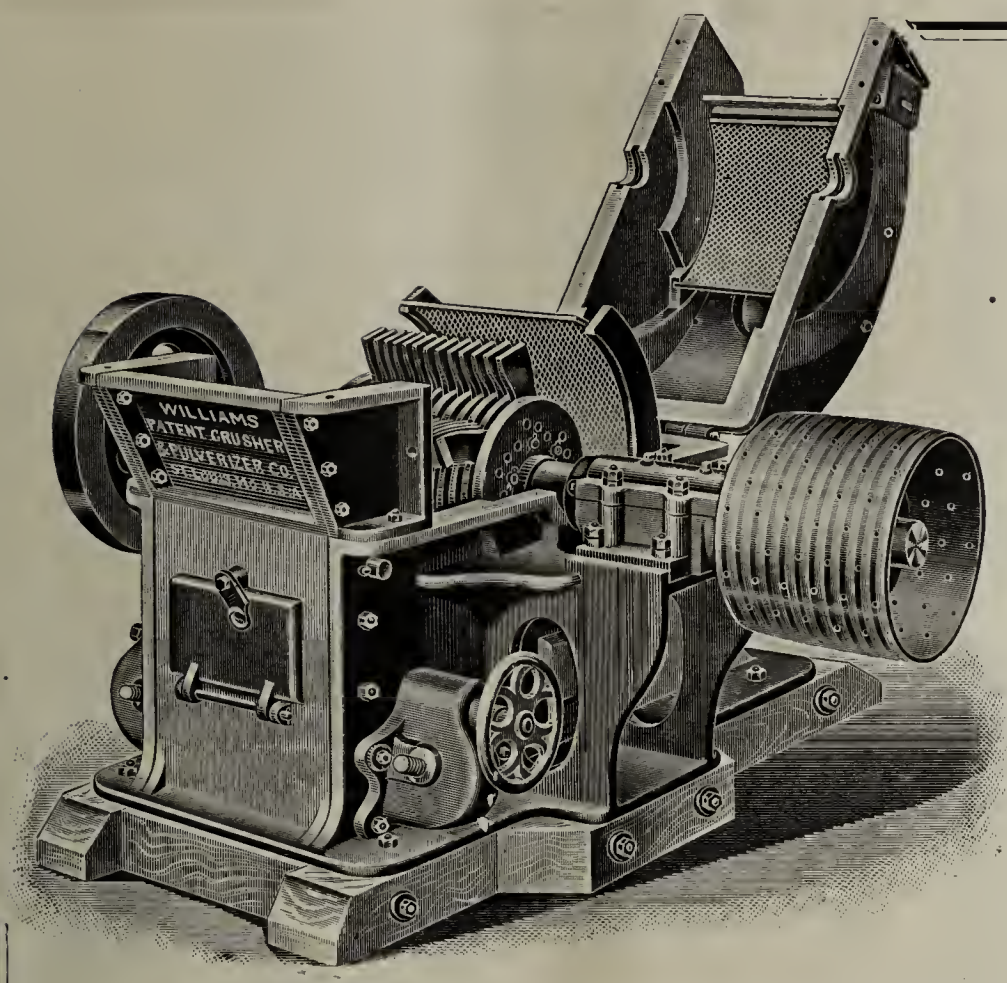
*Manufactured and Sold only by*

## CHALMERS & WILLIAMS

CHICAGO HEIGHTS, ILLINOIS




# WILLIAMS
# LIMESTONE GRINDERS

**Take 2 in. to 3 in. dry stone and in one operation, without outside screens or separators will produce 95% through 20-mesh material.**

**CAPACITIES RANGE FROM ¼ TO 30 TONS PER HOUR**

**Over 5,000 Williams Mills in Daily Operation.**

There is undoubtedly room in your plant for one of these machines, which, in the last twenty-two years have proven that they are money savers, can be depended on, and really have merit. If further information is desired, Write for Bulletin No. 17, which is brim full.

## THE WILLIAMS PATENT CRUSHER & PULVERIZER COMPANY

**General Sales Dept.—37 West Van Buren Street**
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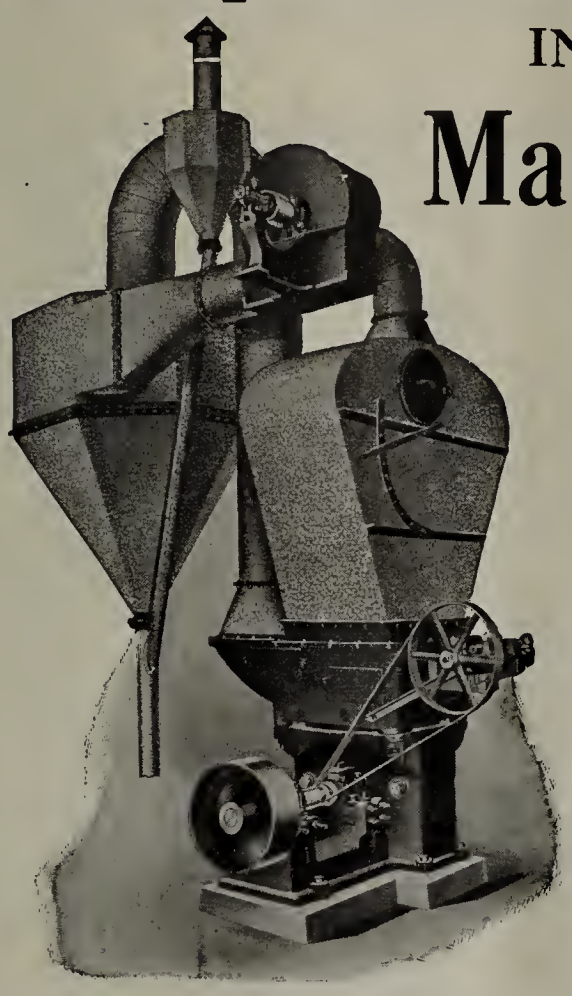
**SAN FRANCISCO**

# Complete Grinding
IN ONE
# Machine



In successful use grinding Cement, Clinker, Limestone, Coal

INSTANT REGULATION OF FINENESS

NO DUST

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**CANTON, OHIO**

# Big Profits
## Making Vaults

Easy to make, and easy to sell.

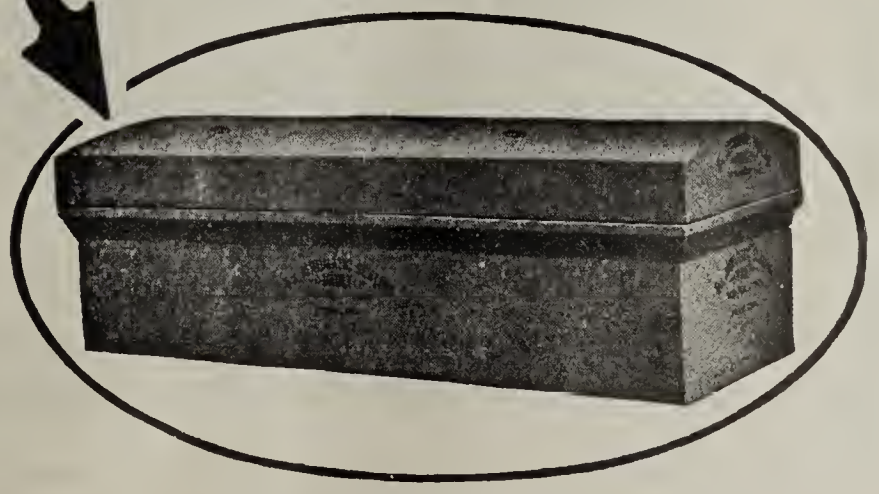
Automatic Sealing Vaults assure big profits and steady work.

You can make these vaults in your spare time, or start a business of your own. The only equipment necessary is a set of our Adjustable Steel Molds.

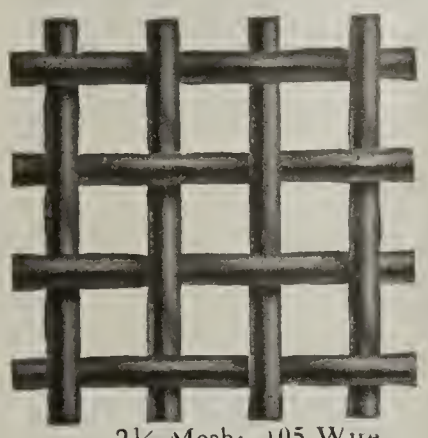
The Automatic Sealing Vault automatically seals itself when the cover is put on; and protects a burial casket forever against water, vermin, and decay. It is cheap enough for everyone and appeals to everyone.

Write for full information.

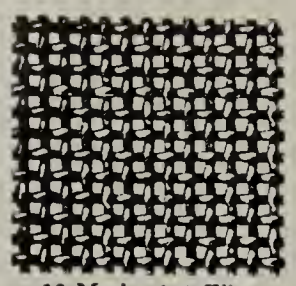
## The Automatic Sealing Vault Company
**216 E. River St.** **Peru, Indiana**



## Cleveland Double-Crimped
# WIRE CLOTH



2½ Mesh; .105 Wire



1¾ Mesh; .047 Wire

Renowned for its Uniformity, its Superior weave, its Durability. Especially adapted for SAND, GRAVEL and CEMENT Screens. A large stock of the various meshes always on hand.

***Price Right—Catalog on Request***

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**3575-83 E. 78th Street, CLEVELAND, OHIO**

# RESULTS
## ASSURED

Maximum production and quality are assured wherever Vulcan Kilns are installed.

We are kiln specialists, and design and build special or standard types to meet specific requirements. We also develop new ideas for their use.

Forty years of study, labor and experimenting has brought "Vulcans" to their enviable position—the most widely used kiln in America.

## VULCAN KILNS

***Interesting to Kiln Users***

Three 9 by 175 foot Vulcan Kilns are being installed by the Western States Portland Cement Company at Independence, Kansas. They are equipped to burn either coal or gas, and another interesting feature is the dust chamber, of which there is one for each kiln, running under the entire length of the kiln and terminating at the 170-foot concrete stack.

You'll be interested in our Kiln booklet. Write for it today, and at the same time tell us your needs.

## VULCAN IRON WORKS

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*"That's What I Have Been Looking For"*

# A One-Man Car Unloader

*For Crushed Stone, Sand, Gravel, Slag, Ashes, Etc.—*

## The Sunbury Automatic Car Unloader

30 Foot Steel Continuous Bucket Elevator, 25 ton Wooden Center Discharge, Portable Bin, 8 H. P. Gasoline Engine, Coupled to the Sunbury Automatic Feeder, which is installed under track carrying the material to the elevator, is the combination that has made a cost of *50 cents per car* for unloading, easily obtained.

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## The Sunbury Manufacturing Company
**Sunbury, Ohio**

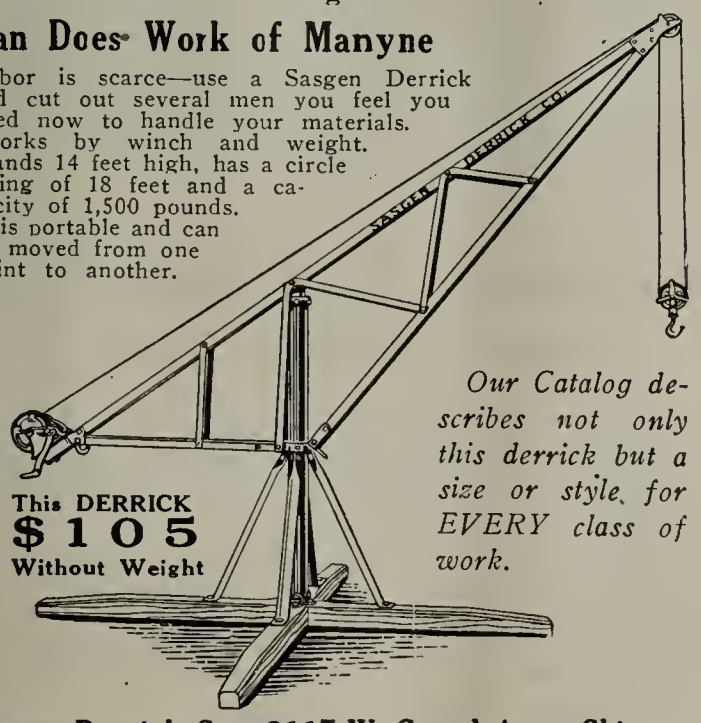
# Load and Unload

## With a Sasgen Portable Derrick

The Sasgen Circle Swing Counterweight Derrick cuts costs, labor and time loading or unloading material from cars or wagons.

### Oan Does Work of Manyne

Labor is scarce—use a Sasgen Derrick and cut out several men you feel you need now to handle your materials. Works by winch and weight. Stands 14 feet high, has a circle swing of 18 feet and a capacity of 1,500 pounds. It is portable and can be moved from one point to another.




This DERRICK
**$105**
Without Weight

*Our Catalog describes not only this derrick but a size or style for EVERY class of work.*

**Sasgen Derrick Co., 3117 W. Grand Ave., Chicago**

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Pavers, Grouters, Hoists, Pumps,

**BOSS** HIGH SPEED

Building Mixers, Backfillers, Elevators

## Contractors' Equipment

BUILT OF STEEL WITH HYATT ROLLER BEARINGS

ASK ABOUT OUR HIGH DRUM TWO BAG PAVER

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PROMPT DELIVERIES

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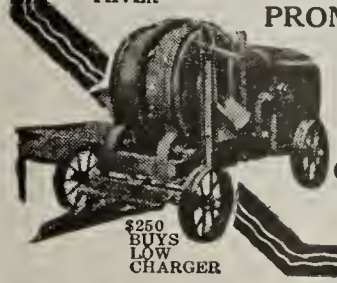
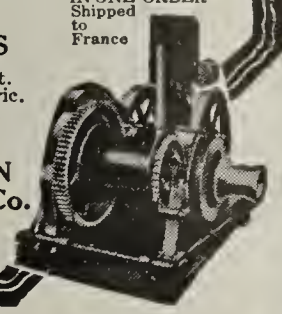
All sizes from 5 ft. to 22 ft. cap., Gas, Steam or Electric. Complete stock carried in or near your city.





THE AMERICAN Cement Machine Co. Inc.
Keokuk, Iowa

$250 BUYS LOW CHARGER

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CALDWELL'S HELICOID

HELICOID Screw Conveyor is heavier, stronger and better made than any other. Requires fewer repairs—no lapped and riveted joints to come apart—flight all one piece. Special hangers, bearings and boxes for cement work. If you have anything to do with the manufacture of cement, you should write for our Catalogue.

Elevating, Conveying and Power Transmitting Machinery.

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DALLAS, TEXAS, 711 Main St.

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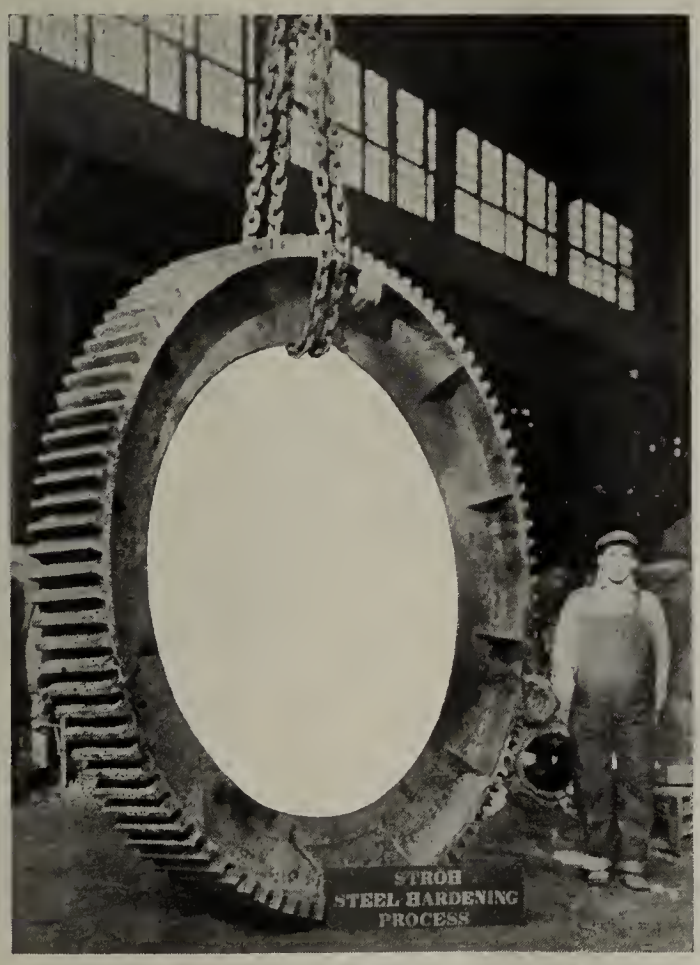
# STROH STEEL CASTINGS




BY THE STROH PROCESS the wearing surface of each casting is made of Stroh Alloy, the hardest known material for this purpose, backed up by carbon steel of lower cost for resilience, ease of machining and economy. Stroh Process castings that receive abrasion in the cement mill are lower in final cost than any other castings, and by reason of this are in use in over 85 per cent of the American and Canadian mills.

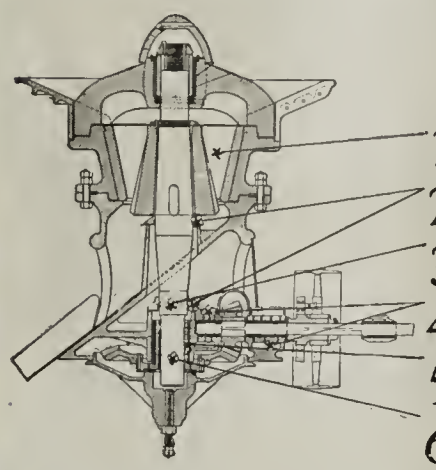
May we send you our booklet telling of the Stroh Process and its achievements? You will find it intensely interesting and, we believe, profitable also.

## STROH
## STEEL HARDENING PROCESS CO.

**Pittsburgh, Pa.**

F. LLOYD MARK, Western Sales Manager, Monadnock Bldg., CHICAGO

# AUSTIN
## GYRATORY CRUSHERS



### *Six Special Advantages*

1. After adjusting for wear of head concaves will receive the same sized rock.
2. Upper and lower collars thoroughly protect working parts from dust and grit.
3. Automatic oil-pump and oiling system, insuring thorough lubrication of all bearing surfaces.
4. Countershaft supported on both sides of driving pinion.
5. Rigid eccentric bearing.
6. Full eccentric bearing surface retained when head is raised.

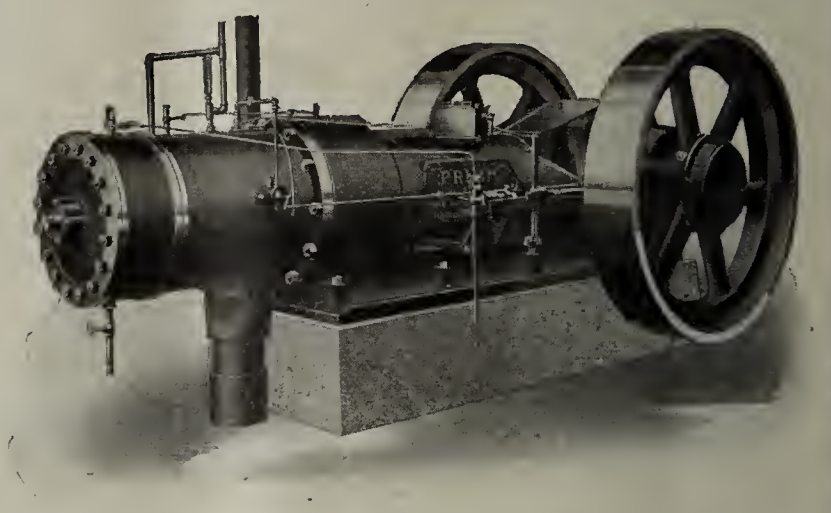
***Made in Eight Sizes— 50 to 5,000 Tons Per Day***

We sell Austin Gyratory Crushers on their mechanical superiority evidenced by the users. Amongst recent purchasers are the United States Government, Australian Government, etc. Austin Crushers have been identified with some of the most important engineering projects, such as the Mississippi Dam, etc.

Present your crushing problems to us for advice and estimate.

**Austin Manufacturing Company**
**CHICAGO**
New York Office: 50 Church Street

# Primm Oil Engines



## Operates on the Cheapest and Most Plentiful Fuel

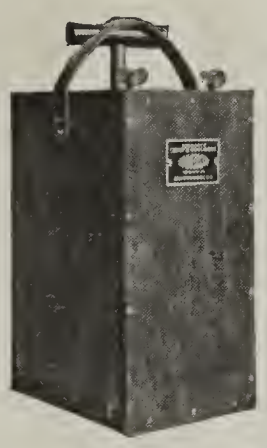
It is not necessary to tell you the PRIMM engine is powerful and durable. Look at them. The appearance tells the story. They are second to none in economy, dependability, ease of operation and starting.

A size and type for every need illustrated in our catalog. Visit our big modern plant.

**THE POWER MFG. CO.** Dept. 4
MARION, O.

DU PONT AMERICAN INDUSTRIES

# Don't Waste Explosives!



Tamp each charge thoroughly to confine the full force of the blast and use the explosive particularly designed for your kind of blasting operation.

One means of conserving is to use Red Cross Explosives. Another economy is to

## Fire Charges Electrically

There is no reason for using dynamite of 40% or 60% strength when the same or better results can be accomplished with a grade of less strength.

And electric firing with dependable Du Pont blasting machines and electric blasting caps, is surer and safer.

Our High Explosive Booklet and our Blasting Supplies Catalog will advise what will best serve you. The coupon will bring you free copies.

Note: When in Atlantic City, visit Du Pont Products Store, Boardwalk and Penna. Ave., and the Shooting School on Ocean End of Young's Million Dollar Pier.

**E. I. du Pont de Nemours & Co.**
**Powder Makers Since 1802 Wilmington, Delaware**

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The Arlington Works, 725 Broadway, New York, Ivory Py-ra-lin and Cleanable Collars.
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| ☐ Sporting Powders | ☐ " Truck Special |
| ☐ Trapshooting | ☐ " Marine Special |
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| ☐ Harrison Paints | ☐ PY-RA-LIN Specialties |
| ☐ Vitrolac Varnish | ☐ " Toilet Goods |
| ☐ Flowkote Enamel | ☐ " Sheeting |
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NAME .....
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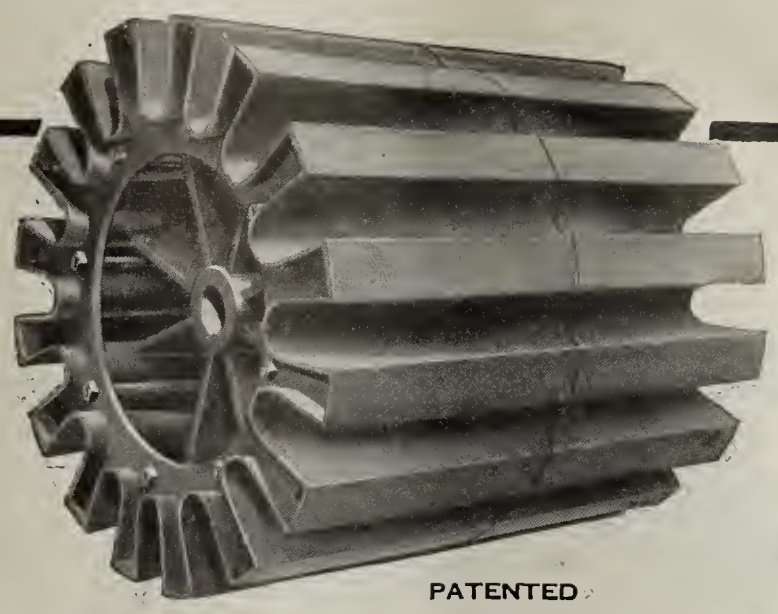
DU PONT

# THE "BLACK" ELEVATOR BOOT PULLEY



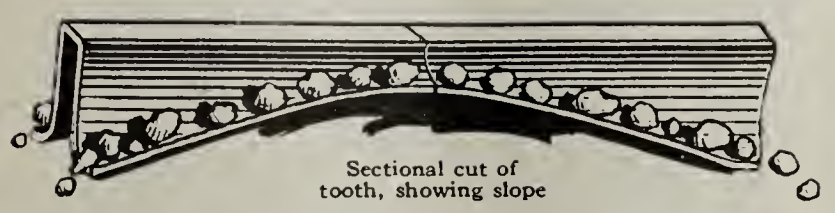
PATENTED

You have wanted this pulley for a long time; you need it now—and here it is—simple as can be and yet giving the *results* that spell economy to you.

Shut-downs in crusher plants are frequently caused by time required in replacing elevator belts that have been cut to pieces by the action of stones which fall between the belt and boot pulley.

The "BLACK" BOOT PULLEY eliminates such trouble. Look at the illustration. The longitudinal grooves—shallow at center of pulley, slope rapidly to the sides (about 3 inches to the foot) so that anything falling between the teeth or being caught between belt and pulley is instantly rejected.

SAVE YOUR ELEVATOR BELTS!



Sectional cut of tooth, showing slope

Manufactured exclusively by us. Made in standard sizes (18"x12" to 32"x44") for standard Gates Elevators and in various other sizes for other types of elevators. Write for information.

**ALLIS-CHALMERS MFG. Co**
**MILWAUKEE, WIS.**

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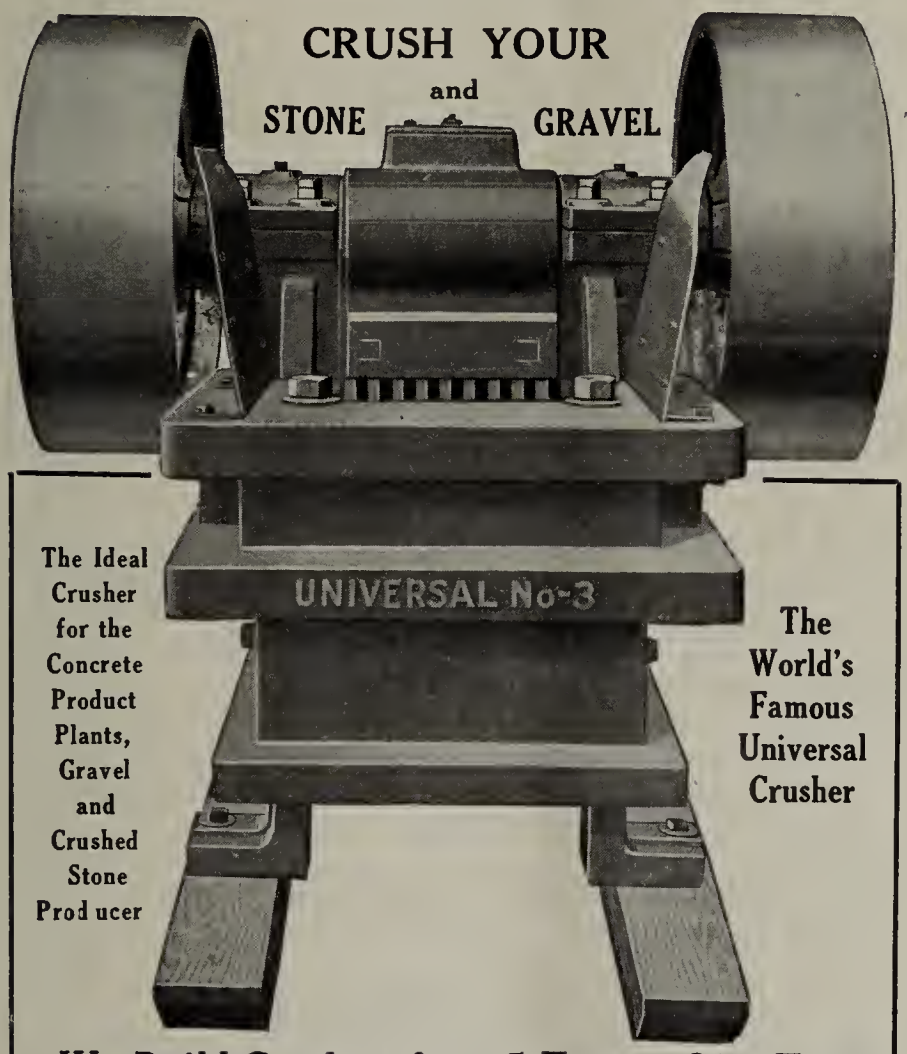
## CRUSH YOUR STONE and GRAVEL




The Ideal Crusher for the Concrete Product Plants, Gravel and Crushed Stone Producer

The World's Famous Universal Crusher

***We Build Crushers from 5 Tons to 300 Tons per 10-hour Capacity***

Instantly adjusted to produce size required from ¼ inch to 3 inches. *Write for Folder No. 14.*

**UNIVERSAL CRUSHER COMPANY**

230 Bee Ave Cedar Rapids, Iowa, U. S. A.

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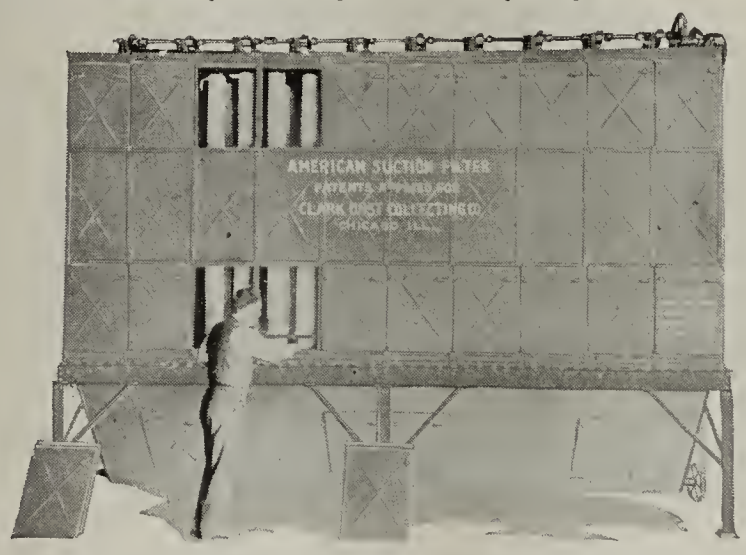
# The *American* Dust Filtering Process

eliminates dust and collects and saves it; thus, saving your men, money and machinery, and increases efficiency of all departments of your plant.




## *The American Suction Filter*

can be used both on raw and finishing grinding on kilns for the recovery of dust and potash. *Write for particulars and data.*

**READ WHAT THEY SAY ABOUT IT**

**SOUTHWESTERN PORTLAND CEMENT COMPANY**
Los Angeles, California

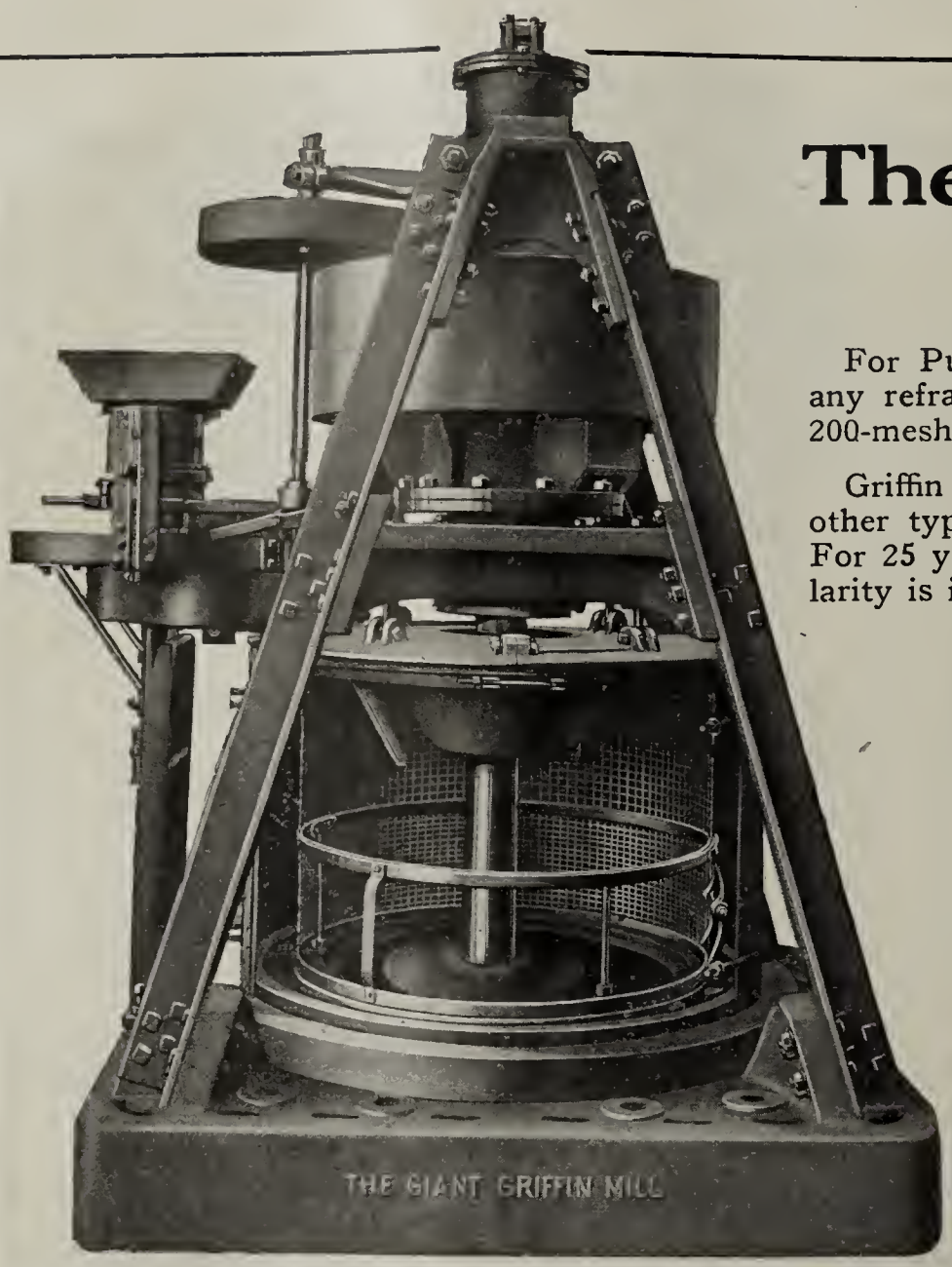
Mr. W. G. Clark, Victorville, Calif.
Care Clark Dust Collecting Co., Saturday, Dec. 29th, 1917.
Fisher Bldg., Chicago, Ill.

My Dear Mr. Clark:—

I have your letter of December 22nd, and in reply will say that we have your Dust Collector working in our Packing Department and is taking care of all the dust around the packing machines. The Collector is plugging away every day and is giving excellent results. So far we have had no trouble or repair work on the installation, and it is collecting all the dust around the packing machines, as you know these machines create a great amount of dust.

Yours truly, L. D. GILBERT, Supt.

**THE CLARK DUST COLLECTING COMPANY**
Dust Collecting Engineers
FISHER BUILDING CHICAGO, ILLINOIS




# The Improved Giant Griffin Mill

For Pulverizing Coal-Cement Clinker, Raw Material or any refractory material where a finess of 83% through a 200-mesh screen is required.

Griffin Mills are used by Cement Plants more than any other type of pulverizer. Now in operation in 45 plants. For 25 years they have led the procession and their popularity is increasing.

Recent improvements have reduced their former low H. P. and Maintenance Cost to the Minimum. Why not investigate this new Griffin Mill?

Recommended for Agricultural Limestone Producers as well as Cement Producers.

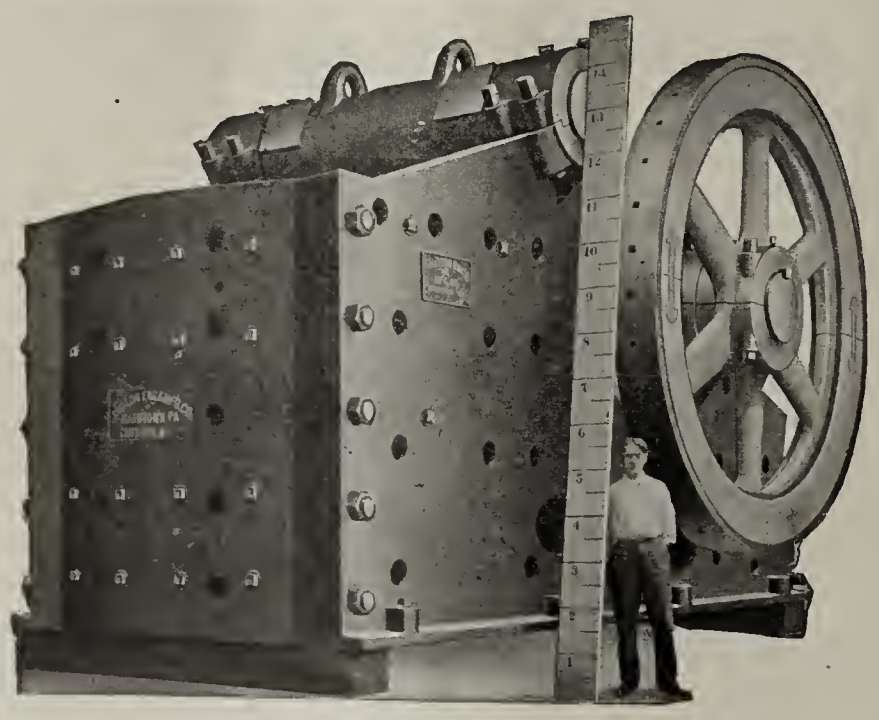
GRINDS ANY DRIED REFRACTORY MATERIAL.

Our Engineers Are at Your Disposal.

## Bradley Pulverizer Co.

**Works Allentown, Pa.**

**BOSTON** **LONDON**



Tray or 60"x86" All Steel Jaw Crusher

## TRAYLOR JAW CRUSHERS

**Are Built in All Sizes from 7″x10″ to 66″x86″**

The 66"x86" is the largest crusher built.

All Traylor Jaw Crushers have cast steel water cooled pitmans.

Extra size pitman and swing jaw shafts of finest hammered steel.

Chrome steel toggle seats.

Manganese steel or chilled iron jaw plates.

# TRAYLOR BUILT MACHINERY

## A CRUSHER FOR EVERY PURPOSE

*We Make*

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**The Traylor Gyratory Crusher**
The last word in Gyratorys.

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They eliminate the personal equation in automatically preventing tire corrugations.

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**The Traylor Ball Tube Mill**
For reducing lumps to fines in one step.

## "THE ULTIMATE CRUSHING EQUIPMENT"

## TRAYLOR ENGINEERING & MANUFACTURING COMPANY

**MAIN OFFICE AND WORKS: ALLENTOWN, PA., U. S. A.**

**New York Office: 30 Church St.** **Western Office: Salt Lake City**

# Cement and Engineering News

Vol. 30 August 1918 No. 8


# ALLEYS

## PAST and PRESENT

AN Alley was once a spot where
cats were wont to meet,
They much preferred the Alley to
the brilliance of the street;
With dissonance they flung their
feline toasts upon the night,
And no one ever stopped them, for
the Alley was a "sight."

The Alley was the birthplace of the weasel and the rat,
And here in sweet seclusion they increased and took on fat.
The common house-fly breeded, and disease germs multiplied,
And people often wondered why so many people died.

Nor was this all the Alley did to make a Boob of man—
It clutched with sticky hands at wheels; to stop them was its plan.
It gave delivery costs a boost, and dirtied up the floors,
And oftentimes when it was wet it kept some folks indoors.

But muddy Alleys, happily, will soon be memories,
Still rife with putrid odors flung upon the summer breeze.
The spirit of Progression has declared disease must go,
And with it muddy Alleys—sanitation's deadly foe.

All hail Concrete, the master Alley, built for horse and man!
Alike in rain or drought it serves the dogcart or the van!
In cleanliness it stands supreme, in sightliness alone
It lends the Alley dignity it ne'er before had known!

The Concrete Alley real estate a higher value gives,
It puts the ban on dust and dirt, but best of all it lives
To render worthy service, holding back the hands of time,
Resisting shock and friction with a courage quite sublime.

Economy, endurance, sanitation, and relief
From black, ill-smelling, rutty mudways, therefore, are, in brief,
The reasons good and mighty why Concrete and nothing more
Should beautify the pathway to the yard and kitchen door.

R. M. McCully.

## To Our Subscribers

On July 1, the law went into effect establishing a system of zone postal rates on all publications. The law provides for eight zones radiating from the place of publication, with progressively higher rates in each zone. These rates will be raised each year for 4 years, until increases have been effected ranging from 50 to 900% higher than the present flat rate of 1 cent a pound.

Few if any publications will be able to stand this terrific and unprecedented burden of extra costs. If they are to continue in existence the additional postal charges will have to be collected from the readers. No industry could withstand a sudden increase of several hundred per cent in the cost of transporting its product, and in any event transportation costs eventually must be paid by consumers, just as we are now paying the added freight rates on our raw materials.

We have faith, however, that the present Congress may yet take steps to remedy the situation, and so for the next few months at least we are going to make a brave effort to get along without a readjustment in our rates, in the hope that it may not be necessary.

We conceive it to be our duty to do our share to ward off as long as possible, the disastrous effects which will surely follow any attempt to penalize the dissemination of intelligence. This is no time to cripple or obstruct our established channels of public information.

## Gives Results of Tests of Road-Building Rock

Results of physical tests in 1916 and 1917 of road-building rock are given in Bulletin 670, recently issued by the United States Department of Agriculture. This bulletin supersedes the department's Bulletin 537, and supplements Bulletin 370 which gave the results of the more common physical tests of approximately 3,650 road-building rocks examined prior to January 1, 1916. The rock tested came from most of the States. In a number of cases, in addition to other tests, the crushing strength of the rock also is given. The bulletin also contains a complete record of all the crushing strength tests made by the office prior to January 1, 1916.

The average crushing strength of granites and gneisses lies between 20,000 and 21,000 pounds per square inch, according to data in the bulletin, and the average crushing strength of limestones and dolomites is between 18.000 and 19,000 pounds per square inch.

Granites, gneisses, schists, sandstones and quartzites should not in general be used in the wearing course of water-bound macadam roads, it is stated, and shales and slate should never be used in this manner. Cementing value tests therefore, have been discontinued on these materials.

## Sand-Lime Brick Association

At the annual meeting of the Sand-Lime Brick Association, held in Buffalo, the following officers were elected: President, W. H. Crume, Dayton, Ohio; vice-president, W. D. MacFarlane, Winnipeg, Can.; treasurer, John L. Jackson, Dayton, Ohio; secretary, R. C. Kiser. Dayton; executive committee, H. W. Perry, Toronto, Can.; Irwin G. Toepfer, Milwaukee, Wis.; W. E. Plummer, Jr., Buffalo, N. Y.; W. J. Carmichael, Plant City, Fla.; L. W. Penfield, Willoughby, Ohio.

## Lime Association Officers Elected at Annual Meeting

The Lime Association, a body recently organized at Cleveland, Ohio, to coördinate the activities now carried on by the Hydrated Lime Bureau, the Agricultural Lime Bureau, the Lime Service Bureau, and similar bodies, has elected W. E. Carson, of the Riverton Lime Co., as president, C. W. S. Cobb, of the Glencoe Lime Co., as treasurer, and a board of directors composed of 14 members. The secretary-manager is to be appointed by the board of directors in the near future.

The meeting was adjourned from Cleveland to Washington for the purpose of holding a conference with the War Industries Board.

A war service committee was organized, with headquarters at Washington, to work with the board.

It is stated by the association that this organization is in no sense a combination of manufacturers, its purpose being similar in nature to that of the Portland Cement Assn., Yellow Pine Assn., Metal Lathe Assn., and many other similar associations.

The various activities carried on by the organizing companies or bureaus will be placed under the direct management of the general association, and are to become departments such as construction, agricultural, product standardization and uniform cost accounting, to meet the desires of the Government and bring about the general betterment of the industry.

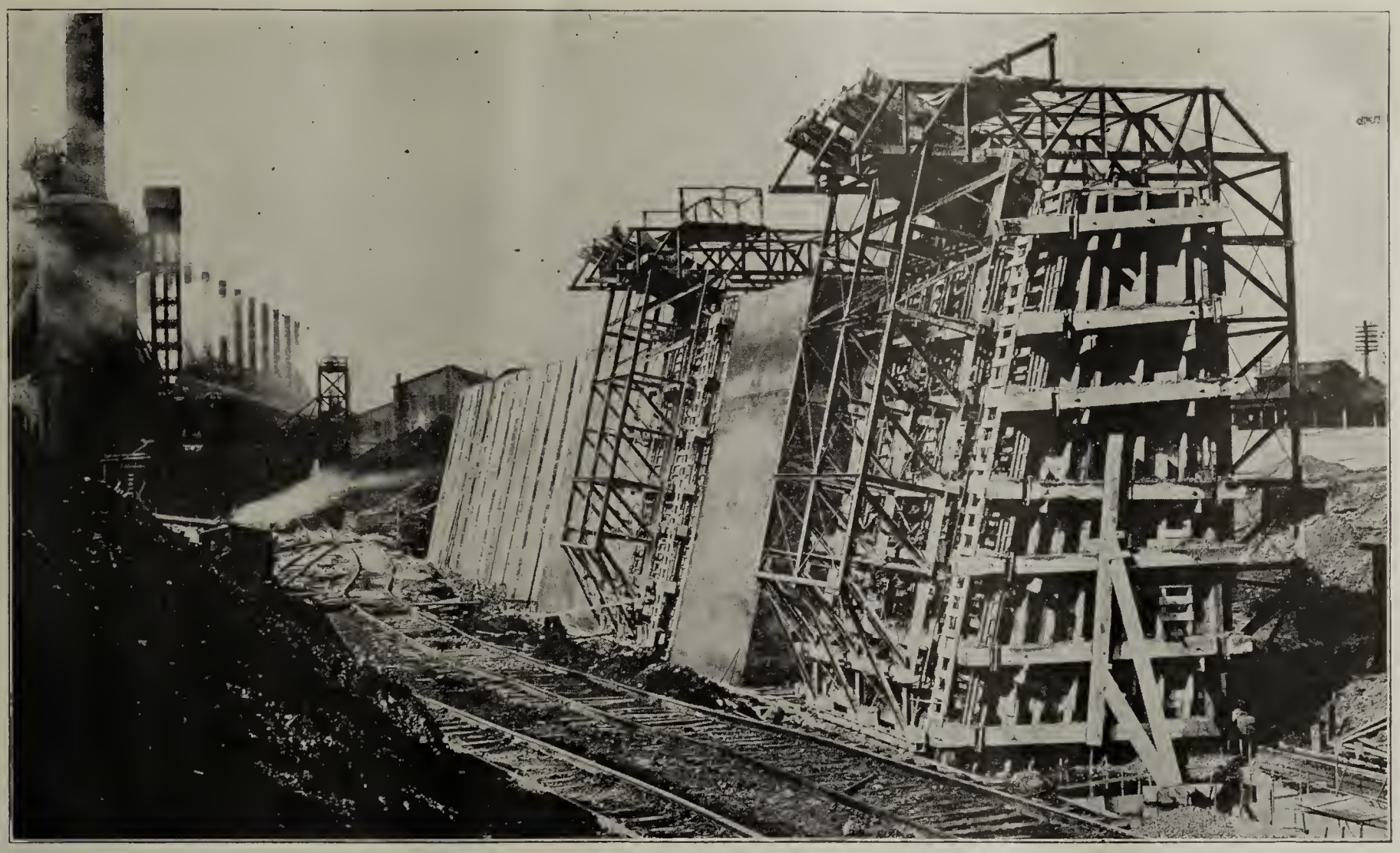
## Beware of This Impostor

A man about thirty years of age called lately at the office of one of the cement companies in Central West, representing himself to be a son of Mr. Calvert of J. Calvert's Sons, Detroit. He borrowed money, promising to return it as soon as he arrived at Detroit office. This man is an impostor and readers are warned against him and requested to give any information that may lead to his apprehension.

## Slag Makes Light and Strong Concrete According to Tests

Recent tests on the properties of concrete made with blast-furnace slag at the University of Cincinnati under the direction of Prof. Curtis S. Myers give indications of the satisfactory nature of this type of aggregate. Preliminary conclusions from the experiments are as follows:

(1) Compression tests show slag and bank sand as used in 1:2:4 concrete to be 17% stronger than concrete made with pebbles and bank sand. (2) Concrete made with slag and bank sand shows greater elasticity and resistance to fracture than does pebble concrete. (3) Weight of slag and bank sand concrete is 16% less than pebble concrete for a 1:2:4 mix. (4) Tensile strength of 1:3 slag mortar is 12.5% higher than bank sand mortar and 62% higher than standard Ottawa sand mortar. (5) Bond strength of slag and bank sand concrete is 15% higher than 1:2:4 pebble concrete. (6) Slag and bank sand concrete withstands higher temperature than crushed stone and bank sand concrete. (7) Transverse beam tests comparing strength of slag and bank sand beams with crushed stone (1:2:4 mix) show slag beams to be 42% stronger. (8) Slag concrete withstands action of acids better than do crushed stone samples. (9) No appreciable corrosion of steel imbedded in slag concrete is noted at the end of one year. (10) Slag concrete resists shock or impact much more successfully than does pebble or crushed stone concrete.



Steel Form with Bulkhead for Individual Blocks on the Right, Form for Filler Sections in Center

## Jacks Replace Tie Rods in Traveling Wall Forms

Steel forms without tie rods are successfully molding for the Brier Hill Steel Co., Youngstown, O., concrete retaining walls 34 ft. high, 10 ft. wide on top and 18 ft. thick at the bottom. The picture shows the wall and the two sets of traveling forms used. The Stone & Webster Corp., Boston, were the contractors.

In place of the tie rods the forms are held together by means of jacks pushed against the trusses of the traveler. These trusses are held at the top by means of cross girders and at the very bottom either by struts placed against offsets in the concrete foundation, or by means of large heavy removable steel rods spaced 10 ft. apart horizontally.

The most notable advantage of this design is that all stresses can be calculated and solved mathematically. This cannot be done with the old type of form, because the efficiency of the laborers has to be depended upon in placing the small tie rods. If one of them is not placed right the form is apt to give or burst.

Another feature of this new type is that the bulkheads, which weigh about ten tons each, are hinged to the form itself so that they swing open as a door when the strutting and some bolts are removed, resulting in another large saving of labor and time.

The form works as indicated in the picture. The first section, furnished with two bulkheads, runs ahead and casts individual blocks. The rear section comes up behind, filling up the alternate gaps between the blocks. This rear section has no bulkheads but overlaps a few inches on the concrete blocks cast in the first section.

A section like this can be moved and set in a forenoon and, if the mixer capacity is large enough, can be filled in the afternoon; in hot weather the section can be removed early the next morning and used again in a similar manner. On some jobs a section of this type could actually be used once every day, even if the wall held dimensions as big as 34 ft. in height, 18 ft. at bottom, about 10 ft. at top and 30 ft. long, which is the case in the one shown in the picture. Generally, however, the work is laid out so that the section is used every other day—that is, with two sections on a job the daily progress consists of a block of the same length as the form sections. The advantages of a form of this type is that a certain schedule can be laid out for the progress of the work and if the necessary precautions are taken it can be followed absolutely and the job finished on specified time. The sections are made adjustable for different cross sections of wall.

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## Lightweight Crusher

There has been some demand for a crusher lighter than the No. 1 Aurora Crusher and to meet it the Western Wheeled Scraper Company has placed on the market a No. 0 Aurora Crusher. It is smaller and lighter than the No. 1, its weight on skids being about 3,550 pounds and on trucks, 8,100 pounds. It has a jaw opening seven by twelve inches and from eight to twelve horsepower is required to operate it. Its capacity ranges from nine to sixteen tons per hour. This new machine may be described briefly as follows:

The main frame is a heavy steel casting. The pulling strain is borne by a yoke of solid forged steel side arms into which the end cross shafts are inserted by hydraulic pressure and keyed in. The vibrating jaw rests on a hardened steel roller, which operates between a hardened steel plate, resting on the frame of the crusher, and a hardened removable steel roller bearing set above it. The pitman is babbitted on the main shaft. The main shaft is made from steel forged from one solid piece. The frame is short and the machine compact.

# Concrete and Cement Stucco Construction for Industrial Houses

A system of construction having for its object the erection of semi-fireproof houses with the rapidity and cheapness of all-wood structures has been devised by Ballinger and Perrot, Architects and Engineers, New York and Philadelphia. Under this system there is a main frame of concrete studs and caps and a wall surfacing of cement stucco.

After the cellar has been excavated a stone or concrete foundation wall is built. In the latter case the concrete is poured from a traveling mixer, with loader, into wood forms made in panels so as to be easily

Fig. 1—Ten-Unit Row of Two-Story Houses

removable. The first-floor wood joists are then set in place on the foundation wall. On these a wood frame, consisting of studs, joists and rafters, is erected in the usual manner of building the skeleton of a frame house. Every fourth stud is doubled, allowing a 3-in. by 4-in. space between, which is filled with concrete to form a concrete stud. At the second floor and roof levels a ledger board, with bottom attached, is placed over the studs and so arranged that, when filled with

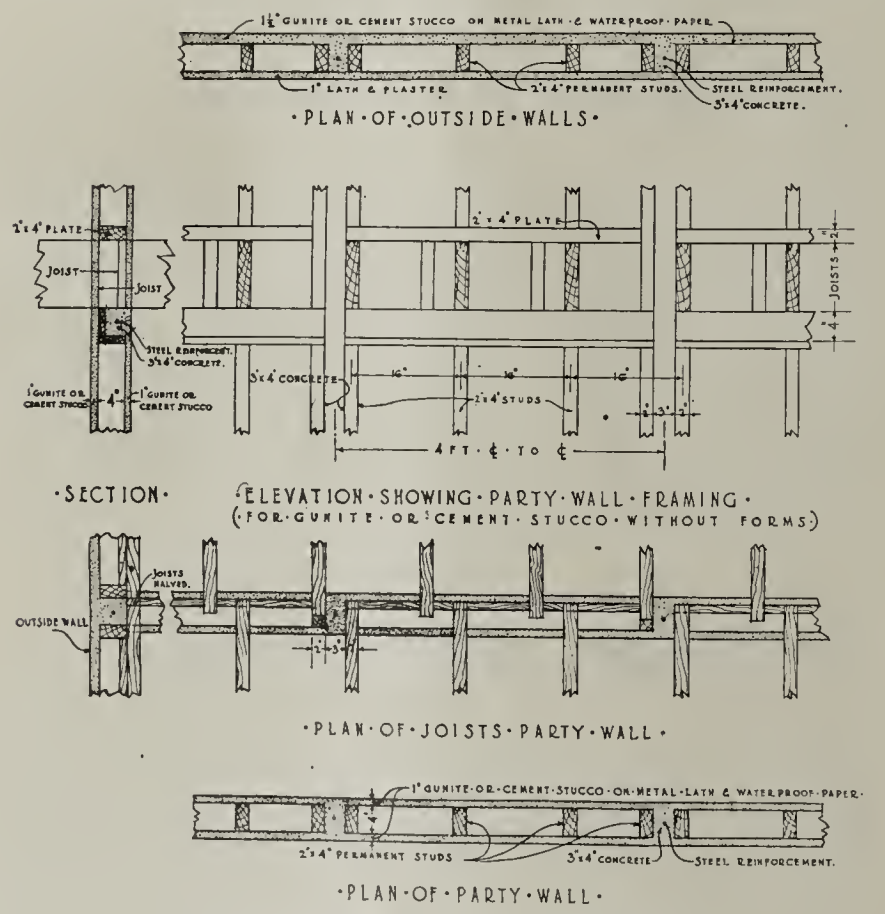


Fig. 2—Details of Wall Construction

concrete, they form beams, which, with the vertical concrete studs, make a homogeneous concrete frame.

The concrete studs, when completed, are continuous from foundation to roof. On top of the lower ledger board the second-floor joists are set, then the second-story studs, and so on. When this frame is completed, including the party wall, and the roof is on, heavy waterproof paper is nailed to the outside of the exterior wall studs, leaving the space between the doubled studs open to receive the concrete. Over the waterproof paper the metal lath, or concrete reinforcement, is stretched. The concrete studs are reinforced with steel rods fastened to the metal lath. The ledger boards have a bottom wood piece or form, so that when filled with concrete they act as beams to carry the floor joists and roof rafters. The wood studs act in the dual capacity of supporting the cement stucco while it is being applied and as furring strips in the finished building.

A 1½-in. to 2-in. thick concrete coating is then applied to the exterior by means of the cement gun, filling the space between the doubled studs to form the continuous vertical concrete stud. If for any reason the cement gun is not available, the continuous vertical studs and ledger boards can be poured with concrete and the exterior metal lath coated with 1:2 cement mortar by hand. The concrete is 33 per cent denser than ordinary poured concrete and about twice as strong. Color effects may be obtained by adding mortar stain to the concrete while it is being mixed. No further treatment of the exterior wall surface is needed.

The rapidity with which this type of house may be erected is stated to be dependent only upon the number of cement guns put into simultaneous operation, or, if the work is done by hand, the number of workmen employed at any one time.

After the framework of any number of houses is once erected the cement can be applied without any interruption, in contradistinction to the usual procedure of stuccoing a part of the work, then shifting the laborers

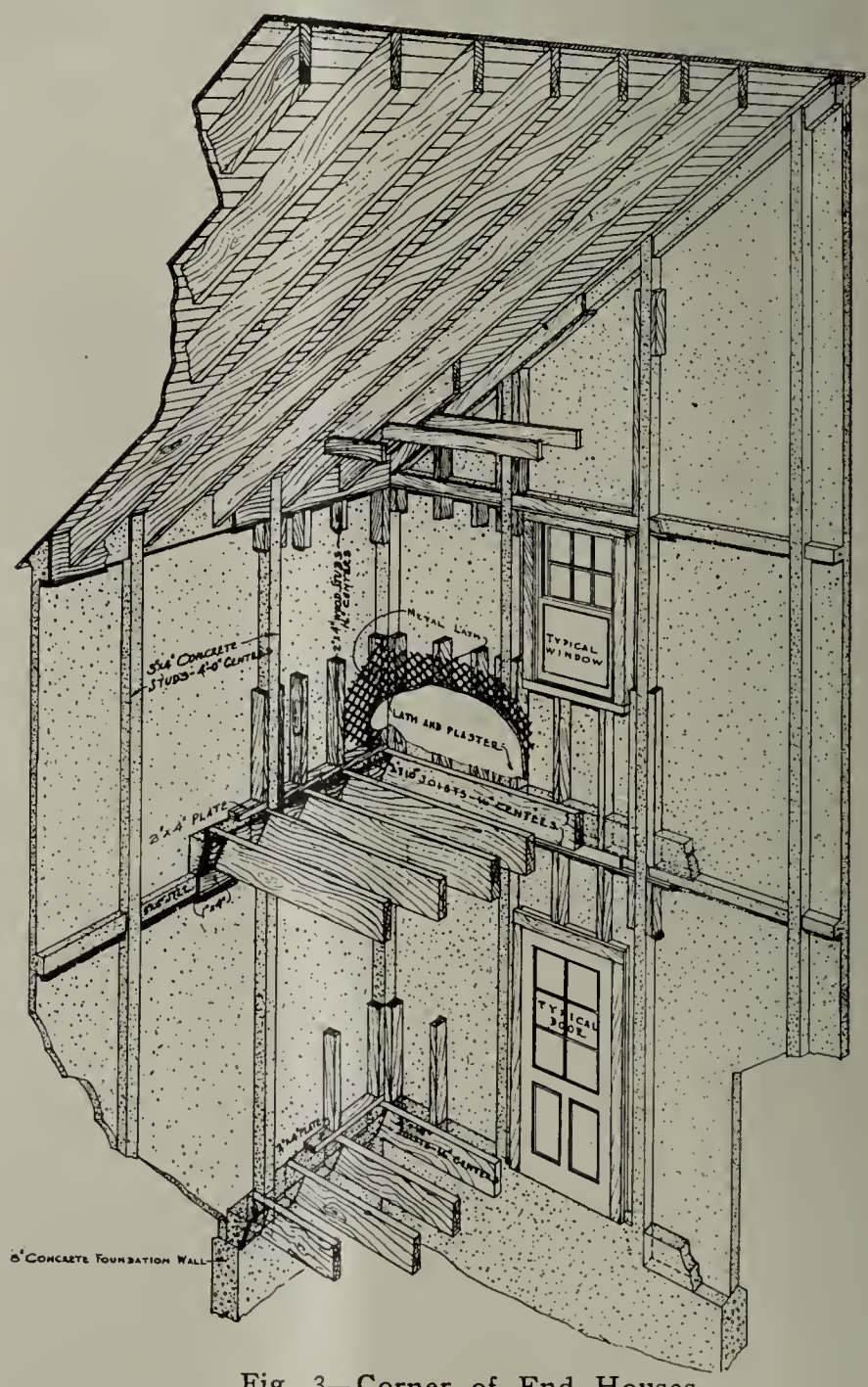


Fig. 3—Corner of End Houses

and their materials to another portion while the first is being completed, and then having to shift them back again. Cracks are said to be entirely eliminated in this

process because the vertical concrete studs carry all the load, so that there is no shrinkage or settlement to contend with in this monolithic structure. Party walls merely have a skim coat of white plaster applied to the cement for a finish.

The roof, whether flat or pitched, lends itself very readily to concrete construction. The concrete may be applied in the same manner as described for the vertical walls, but the expensiveness of the concrete roof construction necessary to carry the roof itself makes it prohibitive for the type of building in which low cost is a prime essential. For the pitched roof there are numerous other good, economical and easily obtainable fire-resisting materials upon the market, including asbestos and asphalted-felt shingles, slate, so-called "ready" and built-up roofings of felt, tar and gravel.

It is stated that by standardizing the style of the houses and applying efficient methods in their erection a row of ten 2-story houses, as shown in Fig. 1, can be completed ready for occupancy in three weeks from the time the cellars are dug. The cost per house of 6 rooms, built in 10 unit rows, as shown in the illustration, is said to be about $2,500.

Precast Concrete Cottages to House Foreign Labor

## Unit-Built Concrete Cottages to House Foreign Labor

Precast slabs, poured in a yard and erected by a traveler, are being used for the first time in this country to construct dwelling houses. The so-called unit method of concrete construction, which is patented by the contractors and has been extensively developed in the railway field for small bridges, railings, trainsheds, and also for warehouse roofs and elevators, is being successfully applied to the construction of 146 dwellings for the first section of a community center being developed by the Youngstown Steel and Tube Co. through its subsidiary, the Buckeye Land Co., for its employees. Located on the hill north of this company's plant, east of Youngstown, Ohio, this settlement marks one of the first attempts to provide living quarters of a permanent and inexpensive type which will be comfortable, sanitary and practically fireproof. The success of the experiment is made possible by the almost indestructible character of the buildings, and by the low cost which could be secured through erecting a large number of houses at one operation.

The method of construction allows the concrete plant to operate continuously regardless of the progress of the other work, and greatly reduces the cost of forms. These advantages, according to the contractor, much more than offset the added cost of rehandling and erecting the slabs after they are cast, which is the only item that would not be required if the houses were poured in place. The use of concrete casting platforms, granulated slag cores for forming hollow wall slabs, and of a traveling erection derrick mounted on towers, characterize the work.

The buildings now under construction will house 146 families, giving most of them four rooms and bath, on two floors. Three different types are being used; one consisting of a unit accommodating one family only; another to house two families, and another for three families. The families in the two- and three-family types are, however, completely separated from each other. These different one, two- and three-family types are combined into groups of several units, varying according to the size of the plot upon which they may be built.

The 146 families will be accommodated as follows: 34 families in the one-family type; 52 in the two-family type and 60 in the three-family type.

Each unit has a cellar, which is arranged so that each family has a laundry of its own. All of the apartments contain four rooms, with the exception of the middle apartments of the three-family houses, which consist of three rooms each. The houses are arranged in rows as shown on one of the drawings, so that there are many party walls, reducing the cost of construction.

Because of the uneveness of the site, all of the streets laid out being on a considerable grade, the houses could not be built at the same elevation. In order to standardize all of the slabs, it was desirable to establish a uniform step between units in each row of houses. It was found that by arranging the groups

as shown and adopting a uniform difference in elevation of 3 ft. between floors of adjoining houses, all the buildings now planned could be fitted to the site with very little grading. The section through the houses shows how the slabs fitted together, and the details adopted to make the joints between slabs waterproof.

The dividing walls between houses are hollow, while all other slabs cast are ribbed. The exterior slabs are set with the smooth face out and the ribs, with wood inserts, form studs to which a lath and plaster wall is secured on the inside. The ceilings of the basement and the first floor are beamed, the smooth side of the slab being turned up. With the ceilings of the second floor, however, the ribbed side of the slabs are turned up, leaving a smooth ceiling below. The window and door openings are cast in the wall slabs, but the window sills are cast separately. After the sills are placed, wooden door and window frames are fitted.

The roof design is of timber framing with 1-in. plank sheathing, on which a red tile roof is nailed. The gable ends are made with triangular concrete slabs. These red gable roofs on the white buildings are expected to give a very pleasing architectural effect.

A casting yard through which runs a trestle track from which the slabs can be cast by chuting from a side-gate car is laid out at the top of the hill, where it will not interfere with any of the houses now being built. Parallel to the trestle and located on the uphill side is a standard-gage track for the locomotive crane which stacks and handles the slabs. Uphill from this, on the side toward the street by which materials are received and near the middle of the yard, is located the concrete plant. This consists of a two-bag batch mixer supplied with material by a car on a narrow-gage track which runs beneath bins into which motor trucks dump the sand and crushed slag through gratings.

As the ground rose several feet in the length of these bins behind the mixer, it was possible to put the narrow-gage track in a cut, construct bins on top of it, and still drive motor trucks from the ground over the bins without having to climb a ramp.

Because the distributing track was located on the opposite side of the crane track from the mixing plant, a short tower was built so that a chute line from the tower to the hopper for loading the concrete car could be placed high enough to permit the crane to pass the concrete plant. Sand, slag and cement are supplied by three motor trucks which work ten hours a day.

Work was first started in the casting yard on the single family and three-family houses, 150 concrete beds and 100 timber beds being required to keep the mixer plant going on slabs for these two types. One form is poured at a time, though of course one batch will fill several of the small forms, such as those for window sills. Two men handle, fill and empty the car on the trestle, while five or six men work in the larger forms and do the finishing. As soon as the concrete has set, the side forms are stripped and match marks are painted on the edges of the concrete. The slabs are allowed to set from two days to a week, depending on the weather, then raised from the beds and stacked on edge with others of the same type. The hoisting is done with wire rope slings and hooks, which are hooked into eye bolts embedded in the concrete. The heads of these bolts come inside the form, recesses being cast around them large enough to permit slipping in the hook. The floor slabs have four such rings so that they can be suspended level, while the wall slabs have rings only in the top edge. The lighter pieces, such as the chimneys and the window ledges, are set by hand and hoisted in bundles with a sling.

The large slabs are carried to the erection derrick in a vertical position and loaded on a car with wooden wheels and upright standards wide enough to hold four or five sections. This car is hauled by a truck, on which slabs and small sections are also loaded. A small portable mixer is used for the footings.

The slabs are unloaded and placed by a stiffleg derrick mounted on three columns, the back pair of columns being surrounded with wood-stave tanks filled with dirt for counterweight. The entire rig weighs 100 tons. The foot of each of these columns rests on a casting containing four rollers, the entire casting being rotated at will with respect to the column and held in place by a pin. This feature makes it possible to turn the traveler on a short radius. The boom is telescoping, and its length can be varied from 50 to 84 ft. The entire rig is patented.

The slabs are set in cement mortar, being handled and placed in the same manner as are masonry blocks in other work.

In addition to the concrete materials, the other work done on the site requires the delivery of 15,000 to 20,000 tons of slag, bituminous road surfacing and building materials. All these must be hauled up a steep hill, a one-way distance of a mile and a half. A 1-ton, a 2-ton, and a 5-ton motor truck are employed constantly, in addition to the trucks on concrete work, and from time to time other trucks are hired.

The road work consists of grading, laying a 4-in. slag base and a bituminous surface and putting down concrete curbs and gutters which are cast in place. In addition, water and sewer systems for the settlement are being laid in trenches dug by hand. All of the work is being carried out under contract by the Unit Construction Co., and is in charge of C. D. Morley, superintendent. For the Buckeye Land Co., a subsidiary of the Youngstown Sheet & Tube Co., the work is under the general direction of P. C. Kuegle, who is engineer of buildings.

## Boss Concrete Mixers

Catalog No. 18, issued by the American Cement Machine Co., Keokuk, Ia., is a profusely illustrated trade publication of 42 pages, 8½ by 11 inches in size, in which is condensed a vast amount of information with accompanying illustrations concerning the various products manufactured by this company. "Built of Steel" is an expression frequently encountered in the course of this catalog and suggests qualities of endurance, which every contractor will appreciate. Under the various specialties considered are building mixers, both side and end discharge, pavers, grouters, back fillers, material elevators, pumps and concrete carts. One feature concerning the illustrations included in this catalog is the painstaking care with which the detailed construction of the various types of machinery is revealed.

The factories of the American Cement Machine Company are located within a stone's throw of the 300 horse-power hydro-electric dam at Keokuk, Ia.

## Concrete Roofing Tile

The National Cement Tile Co., Cleveland, Ohio, has established headquarters in the Rose Building, that city. This company recently was incorporated for $50,000. Manufacture of cement tile roofs will be done by this firm, with machinery manufactured by the Walter Concrete Machinery Co., 418 Sacks building, Indianapolis, Ind. Directors of the concern are: J. W. Thompson, E. F. Hauserman, Sam W. Emerson, H. R. Hohmyer and Mark A. Copeland.

# Oil Storage in Concrete Tanks

The editor of an oil journal recently made the statement that last year the Gulf fields produced something more than 17,000,000 barrels of oil and that the loss in evaporation and seepage from imperfect storage, from waste methods of using fuel oil, etc., amounted to at least a half million dollars, which at present prices would be double that amount. If there is added to this the loss of oil through fires produced by lightning, the total loss per year becomes enormous.

With the earthen reservoirs used in the California fields, and in some sections of the Southwest, for the storage of heavy asphaltic oils, the seepage in an unlined reservoir is close to 4 per cent. It has been shown that if such reservoirs are lined with concrete this loss can be reduced to 1 per cent or less.

In the Proceedings of the American Society of Civil Engineers for August, 1915, is this statement:

"Concrete properly proportioned is impermeable to oil of low gravity under the heads of 18 feet to 24 feet. This is proven by the inspection of concrete in reservoirs which have been standing full for two years. A scratch with a penknife removed the scum of oil from the surface of the lining and showed the concrete white and unattacked in a number of places."

The chief engineer of one of the California oil companies says:

"After seven or eight years' constant use of lined reservoirs, we have experienced no trouble from the oil disintegrating the concrete. I have had test holes cut in the concrete of the reservoirs after they have been in use for a number of years, and found that the oil had penetrated the concrete to but a small fraction of an inch. In many cases the natural dampness of the concrete in contact with the earth seems to prevent the oil being absorbed by any capillary attraction."

As an example of the concrete-lined slope wall reservoir, may be cited the one completed in 1916 at El Segundo, Cal. It has a diameter of 400 feet, with a depth of 22 feet at the center and 19 feet at the walls, and has a capacity of 500,000 barrels. There are also several other large reservoirs of similar type in California, notably the one at Bakersfield of 750,000 barrels capacity, built in 1913, and another at Port Richmond of 1,000,000 barrels capacity, built in 1909.

Underground tanks possess several peculiar advantages. Such a tank keeps the oil at a fairly even temperature, and reduces to a minimum the risk of fire from lightning or other causes. Where the tank is used for storing crude oil with considerable gasoline content, loss by evaporation is checked. These features have definite money value. It is understood that in several instances insurance on oil stored in an underground concrete tank has been secured at a reduction in cost of 50 per cent. One concern that has built several tanks of this type estimates that 15 per cent to 20 per cent of the gasoline value of the crude oil in that locality is lost yearly through evaporation when the oil is stored in the above-ground steel tank, which they state would mean a loss of about $5,000 in a tank of 55,000 barrels capacity. There is in addition the reduction in maintenance and repair charges where concrete is used, as compared with tanks of other materials, and the saving from these sources in a single year will offset a considerable part of the cost of construction.

The condition of underground tanks that are now in service, particularly those holding fuel oil, proves that good concrete is not injured by the oil and that careful design and good workmanship are the chief factors of success. A company in San Antonio, Texas, writes:

"We have had a concrete oil tank in use here since 1905 and so far as we know there has never been any leakage from this tank or any injurious effect on the concrete by the oil. * * *

"This tank has never been entirely emptied, but we expect to empty it this summer.

"We have three other oil tanks, put in at later dates, which have also given us satisfactory service so far."

Later on, after the examination referred to had been made, it was found that the oil seemed to penetrate the concrete at certain points, and indicates the need for high class work.

"These points appear to be at the places where there were interruptions in the pouring of the concrete. A considerable quantity of oil drained back out from the walls into the tank after we had pumped it out. We dug down on the outside of the tank and the leakage there was apparently small, and we have put the tank back into service. There were no vertical cracks in the concrete and apparently, if the concrete had been poured continuously from top to bottom there would have been practically no leakage."

A fuel oil storage tank of 145,000 gallons at Millers, Nevada, has been in use ten years and has had no repairs, and as far as the superintendent is aware, no leaks have developed.

Two fuel oil storage tanks of 75,000 gallons capacity each are just being put in service at the plant of the Union Switch and Signal Co., Swissvale, Pa. These tanks are 15 feet wide, 74 feet long and 9½ feet deep, divided into four compartments of equal size. A 1:1½:3 concrete was used and the tanks were finished on the inside with a 1:1 mortar, treated with a solution of water glass or sodium silicate as an extra precaution. The walls and floor were cast continuously, in order to prevent any planes of weakness.

The elimination of construction joints, or reducing their number to a minimum, is of great importance, and construction should proceed continuously wherever it is possible to arrange it.

At Charles City, Iowa, a metal strip was used to seal the joint between the floor and the walls of an oil tank and this proved a very successful means of preventing any seepage of oil at this point.

Underground concrete tanks are used for the lighter oil products. At Dewey, Okla., there are two tanks holding lubricating oil which are giving excellent service. One tank was built in 1907 and the other in 1910. At Austin, Minn., there is a 25,000 gallon tank holding gas-oil, which has been in use since 1913. At Muskogee, Okla., there are three underground reinforced concrete tanks of 1,500 barrels capacity, each of which is being used for the storage of benzine and finished gasoline. These latter tanks are made tight against penetration by the application of a special coating to the inside surface.

Concrete tanks offer a convenient storage for road oil, and the 100,000 gallon tank built by the Davis County Turnpike Board at Nashville, Tenn., is an indication of what can be accomplished in this direction. Steam coils are placed in the bottom of each compartment of this tank to keep the oil at desired fluidity to facilitate drawing out when needed.

The essential features of successful construction of oil tanks are:

Adequate protection of the concrete during hardening.

Thorough hardening prior to the time the tank is placed in service.

Proper finishing of the inside surface of the tank, depending upon the character of the oil which it is to contain.

A proper design, with sufficient reinforcement to insure the integrity of the structure.

Use of a rich mixture of concrete, placed as continuously as possible, so as to form a dense, compact mass, free from construction joints or seams.

# How Glazed Cement Sewer Pipe is Made

The California Glazed Cement Pipe Company is now operating its plant recently installed just east of the Los Angeles river near Twenty-sixth street and Boyle avenue, Los Angeles, and is working two shifts in order to accumulate a stock for a number of sewer jobs, contracts for which have been awarded within the last few weeks, most of which are in Los Angeles city. The plant has already turned out and has delivered the greater part of five miles of cement pipe for one sewer contract at Long Beach. It has been found more economical to furnish the pipe for the laterals now under way there, from its Los Angeles plant than to establish a plant at Long Beach. The pipe is made and cured here and shipped by railroad to the beach city twenty miles to the south.

The pipe machines employed are known as the Thomas-Hammond patent, but the original design of the equipment has been improved in many features where experience has taught that greater efficiency could be secured. These machines produce both bell and plain pipe from 4-inch to 30-inch diameter. The pipe making machine consists of a circular table which revolves at a speed of 35 revolutions per minute. The outside steel form is placed on this table and the inside form or core is dropped down into position. The core does not revolve, the pipe instead revolving around the core and thus producing a trowelling effect on the inner surface of the pipe. As the concrete falls into the mold it is machine tamped, the eccentric tamper striking 400 blows per minute, each at 350 lbs. pressure and so timed that the blows overlap each other. The tamper, held by a leather friction device, gradually raises as the pipe is built up in the mold, the machine being so built that the tamper cannot raise until the concrete is compacted to proper density. After the straight body of the pipe is built up to the bell, the operator drops in the detachable form for the bell, the top ledge of the bell then is finished by the operator pressing firmly down with a trowel, the pipe still revolving, after which the core is elevated out of the pipe. The operation of making a length of 8-inch pipe requires, with an efficient operator, two minutes.

The pipe is taken from the machine by the off-bearer who deposits it on a concrete platform and strips off the outer collapsible steel form, leaving the green pipe resting on a detachable ring. The strength of the green pipe is indicated by the fact that the pipe, standing on end with the added weight of the bell at the top, supports its own weight. The off-bearer handles this green pipe with a two-wheeled cart built on the principle of a lever, with which he picks up the form-encased pipe, carries it to the curing yard and deposits it without touching the pipe with his hands. The forks project forward from the frame of the cart, these forks being inserted under brackets attached to the side of the mold.

The pipe-making unit requires a crew of three men —a mixer man who attends to the mixer, loading it with sand, gravel and cement, turning in the necessary amount of water and discharging the mixed aggregate into the hopper; the operator who stands at the machine itself and controls the entire pipe-making processes; and the off-bearer and stripper, who carries away the finished pipe and brings up the empty forms. The mixer man controls the amount of water by experience, knowing by testing of the aggregate by the feel of the hand whether or not the mix is too dry or too wet. To the unpracticed person, the right mixture seems hardly wet enough, yet the tamping is so powerful that the inner and outer surfaces of the finished pipe take on the appearance of having been made with a much wetter mixture.

In cement sewer pipe the requirements for density, watertightness and strength are so much greater than in ordinary concrete and the shell thickness is relatively so much less, that the aggregates must be graded most carefully. The 10, 40, 80 and 100 mesh screen must continually be used to keep the grading proper, and to get this result specially fine sand or rock dust and pea rock must be added in certain quantities to the regular sand.

The pipe is left standing in the curing yard seven days, being wet down every few minutes each day according to conditions of the weather. After being cured it is stacked up awaiting shipment. One man attends to wetting down the curing pipe, stacking it after curing and helping load shipments.

A fifth man of the crew fashions the Wyes. These are made by cutting out a section of the pipe to which, after proper curing to enable it to be handled, the other section of the Wye joint is cemented with a rich mortar collar. These Wyes have been subjected to all sorts of severe tests which prove that a well-fashioned Wye has great rigidity and strength, in both the branch pipe and the joint.

The capacity of the present units at the Los Angeles plant is 1600 feet of 6-inch pipe and 1000 feet of 18-inch pipe per day, working three shifts. The company is now installing another unit for the manufacture of the larger sizes, 18-inch to 30-inch. This machine operates on the same principles, but there are two tampers instead of one, the core is pulled down out of the finished pipe instead of up, and the tamping is much more powerful, each blow on the larger sizes being 600 to 750 lbs. To operate this unit requires another crew of nine men.

Two sections of 8-inch pipe picked at random from the stock piles, when tested for the writer, showed no percolation after being held at 15 lbs. water pressure for 5 minutes, and although not fully aged withstood 70 and 75 lbs. hydraulic pressure, more than double the requirements of the Los Angeles city specifications for sewer pipe which fixes the minimum of 35 lbs. hydraulic pressure. It is said the majority of sections of this machine-made cement pipe when fully aged withstand 100 lbs. pressure before bursting, some having gone as high as 140 lbs. Tests of crushing strength now being carried on by the city on some of these pipe sections are running 25% to 60% higher than the requirements of the city specifications.

The California Glazed Cement Pipe Company is operating two other plants, one at Merced, California, the other at Glendale, Arizona.

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## Concrete Railroad Ties

The Saxon Tie Company, Arkansas City, Kansas, is the name of a new company recently organized by Mr. J. W. Saxon to manufacture a patented two-piece concrete railway tie. A small number of these ties were placed in the track at Arkansas City in September, 1917, and they are in as perfect condition to-day as when they were first placed in the track.

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Employes of the Atlas Portland Cement Company proved to be 100 per cent loyal in the third Liberty Loan drive. That means that every one of the 980 employes purchased Liberty Bonds. They invested a total of $57,000.

The Akron Sand and Gravel Company's Large Modern Plant

# A Large Capacity Sand and Gravel Washing Plant

The size and capacity of the large sand and gravel washing plant of the Akron Gravel & Sand Co., Akron, O., exceed any other land operated plant so far constructed. The daily 10-hour capacity is 100 cars of washed material.

The material is excavated by steam shovels and brought to the plant by two Vulcan locomotives, each handling two 30-yd. dump cars. One car of each set dumps from the bottom and the other cars dump from both sides. The tracks from the pit are elevated and pass over a large concrete hopper holding about seven carloads.

The material is drawn from the hopper through an opening in the bottom onto an apron feeder 48 ins. wide. This feeder is operated by a variable speed motor, geared direct to an oil immersed worm gear drive. This construction is novel and is arranged in this manner to govern the capacity of the plant. The speed of the feeder regulates the output of the plant.

The material from the feeder is delivered into a large stone screen 60 ins. in diameter, which separates the stone to be crushed from the aggregate. The material which passes through the stone screen is delivered direct to the main elevating belt and the over-size from the screen goes to the large steel crusher elevator. This elevator is not an ordinary elevator by any means. The chains are built up of 4½x⅝-in. open hearth steel bars and the chain pins and bushings are chrome nickel steel. The chain rollers are steel and the sprocket wheels on the head and foot shafts have renewable manganese steel teeth. The buckets are of the continuous type 36 ins. wide and reinforced by heavy steel lips.

The material from the elevator is discharged onto a bar grizzly which divides the large stone for a No. 6 Gates gyratory crusher and the remainder goes to a 48-in. Symons disc crusher. The product from each crusher is delivered onto a 30-in. belt conveyor which carries the crushed stone back to the stone screen for rescreening.

The main belt is 36 ins. wide and has a six-ply rubber conveyor belt with ⅛-in. extra rubber cover on the carrying side. The troughing idlers are of the Link-Belt. Co. type, with five pulleys each. The main conveyor is 270 ft. long and the conveyor gallery is enclosed for protection from wind and storm.

The gravel washing equipment consists of 16 Dull type inclined washing screens mounted four in a row with provision for two more rows or 24 screens in all. The sand is separated by eight 72-in. conical sand separators with provision for four more. These tanks work automatically and present a very interesting sight to anyone who can observe the operation of four tanks working in unison.

The screens and tanks make five grades of material which are delivered into seven large bins. The sand bins are arranged at both ends of the plant and contain fine sand for plastering and brick laying and coarse sand for concrete work. The bins are 144 ft. long and 26 ft. wide and the height of the plant at the center is 90 ft.

Loading tracks go on both sides of the plant and segmental type gates are used for gravel and slide gates of a special design for the sand bins. The bins are built for cribbing the plank and are stiffened by steel rails vertically with the rods running through the bins. This construction is unusual but very satisfactory.

A center tunnel runs through the center of the plant in order to facilitate getting from one side to the other.

The washing water is pumped to the plant by an 8-in., two-stage centrifugal pump direct connected to a 100 HP. motor. The water distribution is novel and very elaborate and quite effective. The material is given a preliminary washing in a stone box and the water jets do the distributing for the four different sets of washing screens. By-passes for taking out the great volume of sand are also provided as well as a rinsing system while loading and when delivering from screens.

The plant is electrically driven throughout by individual motors and each half of the plant can be run independent of the other. Westinghouse motors are used and power is furnished by the Northern Ohio Light & Traction Co.

This plant on account of its large capacity is designed for low cost of production, yet nothing was spared to insure against liability of breakdown. The machinery is designed unusually heavy and strong and all supports are also very heavy. The plant was designed and engineered by The Raymond W. Dull Co., 1910 Conway Building, Chicago, Ill.

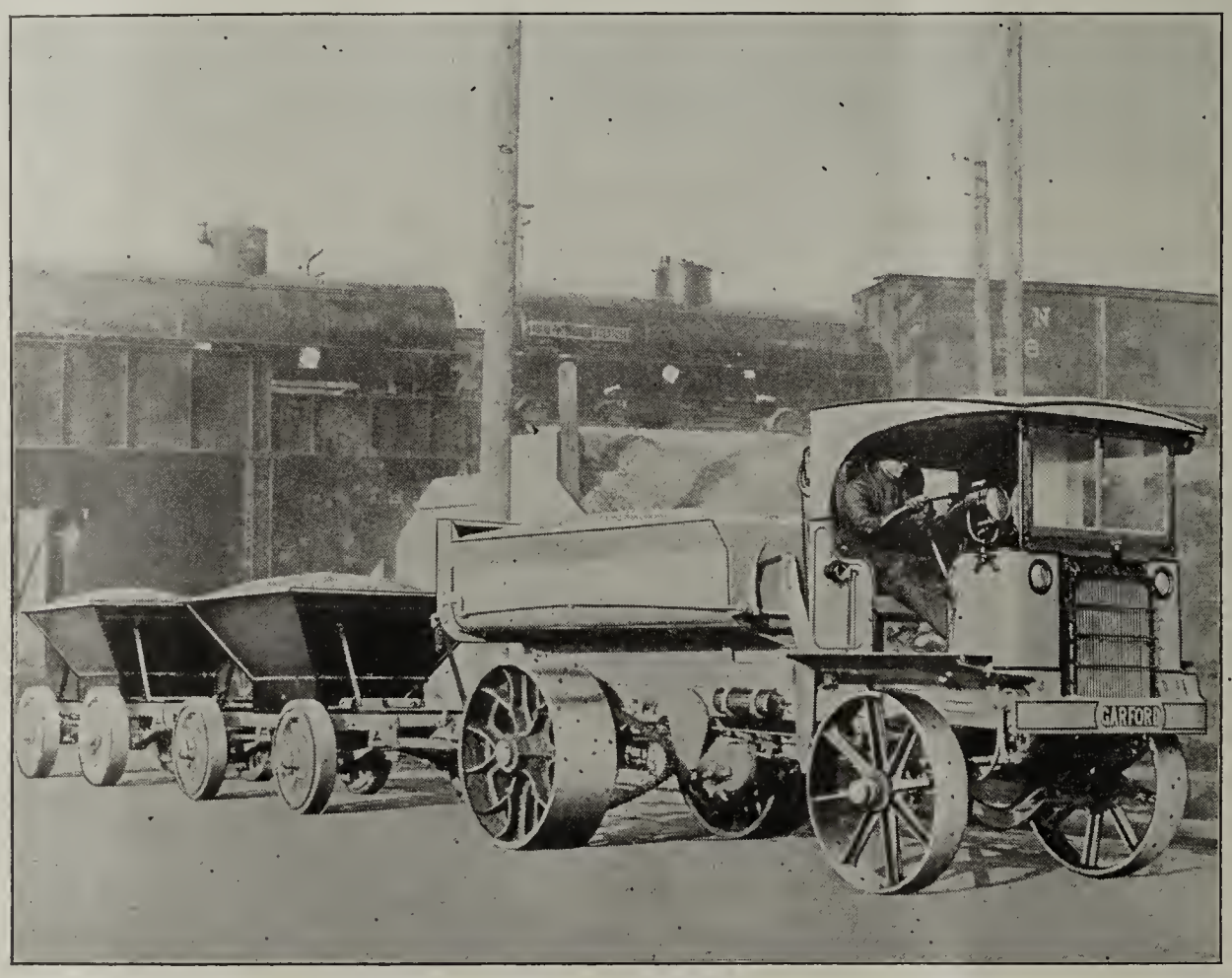
# The Motor Truck and Trailer in Road and Street Building, Repair and Maintenance

Courageous, indeed, was the contractor who a few years ago purchased a motor truck as part of his road-building equipment. Conceded to be all right for the manufacturer, jobber, and merchant it would never do to haul material on a new grade, make the short turns often required, or take the place of horse-drawn equipment.

The day is now past, however, when the road and street contractor looked upon the motor truck as an experiment. To-day it is admittedly one of the most essential pieces of his equipment, not only for hauling purposes, but for pulling scarifiers, graders, drags, distributors, sprinklers, and a hundred and one other jobs.

Many counties are joining the long list of truck users in the road field and are proving their value for work on county, township, and local roads, and the day is fast approaching when practically every county in the United States will own motor equipment for road-building purposes. Counties now owning several road-building outfits have added a truck to each outfit resulting in an increased mileage and a reduced cost per mile of road built.

There are many truck manufacturers making good serviceable trucks. The ones shown here have been tried by road builders with satisfaction. It is not the intention of this article to advocate the purchase of



A Dump Body Truck Loaded with Six Tons of Road Material and Hauling Two Trailers Loaded with Five Tons Each

Cities have not been slow in recognizing the advantages of motor equipment. The fire department was probably the first to adopt mechanical-propelled apparatus in preference to horse-drawn equipment. Then followed the street-cleaning department with motor truck garbage wagons, street sweepers, flushers, and sweepers. Next, the Department of Public Works adopted motor equipment for hauling sand, gravel, crushed stone, brick, cement, asphalt, and other materials for their street repair work. All have adopted the motor truck and found it not only profitable, but a saver of both time and labor.

State Highway Departments own and operate fleets of motor trucks both in new construction and maintenance work performed under their jurisdiction. In States where highways designated as State roads become the property of the States and are maintained by them, motor trucks, of small capacity, in many cases have been furnished patrolmen for use in hauling material and caring for their section of the road. In States having large mileage of macadam roads, where the carpet or surface treatment is extensively used, State-owned motor pressure distributors cover many miles of roads in a season that would be impossible under the old method.

any one particular truck, but to impress on our readers the fact that not only has the day arrived when a large part of the transportation of the country will be carried on over the public highways by motor trucks, but that the day is also here when the motor truck is an absolute necessity in the equipment of contractors, State highway department, cities, towns, counties, and townships in the construction, repair, and maintenance of roads and streets.

George A. Kissell, president of the Kissell Motor Car Company, gives some mighty interesting data in the following:

### Military Roads Needed Connecting Our Larger Cities

The number of registered automobiles has increased from 3,394,314 in 1916 to over 5,000,000 in 1917. The State of Illinois alone showed an increase of 92,000 registrations in 1917 over 1916.

Of the 1,806,194 motor vehicles produced by American manufacturers in 1917, 112,200 were motor trucks, and during the last six months the proportion of trucks has been greatly increased by the government's war orders, which have involved for many builders a big addition to their normal business.

### Mars on a Truck Chassis

Three years of war have done much to perfect the motor truck. And at the same time, war has raised the price of horse meat to an almost exorbitant figure. War has already forcibly increased the capacities of American Motor Truck factories and in case the war continues for any greater period we can look forward to further almost revolutionary changes.

The activity of 1917 is but a foretaste of what may come to American truck manufacturers, but that beginning in the year 1917 toward placing Mars on a truck chassis also included arrangements for producing thirty thousand of the new three-ton standardized trucks—an order which alone equals one-third of the entire number of trucks actually produced by all factories during the past year. Contracts for ten thousand of these, amounting to approximately fifty million dollars have already been awarded.

In addition, the army will need enormous quantities of lighter standardized trucks and thousands of those built according to the manufacturers' individual designs. Many of these also have been ordered during the recent months of 1917.

### Military Use of Highways

For years the automobile has been fostering good roads, and now you may truthfully say that whatever good highways we have are mobilized for war uses.

The Highways Transport Committee of the Council of National Defense, of which Roy D. Chapin, of Detroit, is chairman, is sending pathfinder cars over various routes from the Central States to the coast, at the request of the Quartermaster's Department, to find the most feasible roads for sending overland the Government's standardized trucks. If this plan goes through, it will be the first great military use of the highways. No doubt there will be much inspiration in seeing these truck trains, with their personnel of soldiers, passing through the country. Just now the National Highways Association is fathering a system of fifty thousand miles of national highways, which would serve eighty-four million people.

Another feature of road mobilization is prospective legislation fathered by the American Automobile Association and the American Association of State Highway Officials for a marginal national highway around the border of the United States with various radial highways, to facilitate movement of troops, equipment, munitions, and supplies in times of war or peace. Altogether, motordom mobilized looms big and formidable in our program of war.

### Trucks Relieve Railroad Congestion

Motor trucks, during 1918, will be extensively used in the inter-city and inter-State haulage of freight, and the greater this traffic on our highways the more urgent the need for more thousands of miles of hard-surfaced roads connecting our larger centers and in the construction of these highways, motor trucks will be extensively used. Then the motor truck becomes an increasingly important factor not only in relieving railroad congestion, but in rushing to economical completion a net work of permanent highways.

The American farmer has been appealed to from every source to increase his crops that the world may be supplied with food and that the price may be kept down. Yet not a bushel of grain nor a pound of meat is grown in the country that does not, at some time in its journey from the point of production to the point of ultimate consumption, pass over some of our American highways on its way to the railroads.

As we were unprepared in shipping and in railway requirements, in munitions, and war supplies, so were we also unprepared in the physical condition of our highways for this sudden transformation of trade. But as we have met the other and greater problems so can we meet and solve this one.

### Build Highways to Fit Traffic

Thoroughly organized freight and express service might well be adopted by those communities suffering from freight congestion, utilizing the motor truck for the collection of raw materials and the delivery of finished products within a radius of one hundred to one hundred and fifty miles. In fact, this is the immediate purpose to which the recently appointed Highways Transport Committee of the National Council of Defense are giving their attention. The motor truck is not to-day a vehicle of cities and towns; we see it on every road in the country, improved or otherwise, but in order to realize the maximum from freight haulage via motor trucks, the highways should be built to stand the traffic.

### Road Building a War Necessity

Inter-city haulage of commodities is not an experiment. Its practicability has been established and a schedule has been urged to declare road-building a

Steel Dump Body mounted on a 5-ton chassis. Property of Warren County, Miss., and shown at work grading one of the country roads.

3½-ton Dump Body Trucks owned by Escambia County, Florida, drawing an Austin Grader and used for road building in that county.

A Standard Freighter and Heavy Duty Dump Trucks, owned by Jacob Karth, West Allis, Wisconsin, hauling sand and gravel from the pit direct to the job.

war necessity and to formulate a definite plan that will nationalize the work throughout the country. The needs of the Federal government might require the designation of certain main roads that are of military or strategic importance to be national roads. Congress should provide that the links and gaps in the roads should be improved at once with all the resources and funds available for that purpose by the Federal government. If needed, it should be provided that all bridges and culverts be strengthened for carrying heavy guns and other large loads. Congress might further designate as a secondary system those roads of primary importance to the industrial centers of the various States.

### Need of Federal Highway Board

Realizing the transportation congestion crisis, the following resolution was adopted by the Chamber of Commerce of the United States, at its Atlantic City Convention:

WHEREAS, It is essential that all the transportation facilities of the nation should be brought to the highest state of efficiency in order that foodstuffs may be moved most economically from the farm to the market, that manufactured products be moved at the lowest cost from the factory to the consumer. and

WHEREAS, The public highways offer a good, prompt, and economical means to supplement transportation by rail and water, therefore,

*Be It Resolved,* That the prompt improvement of our public highways is important and should be forwarded in every proper way.

Motor trucks are ready at hand; the roads of the nation must be immediately developed and improved. A Federal Highway Board is urgently needed.

American motor truck manufacturers are "doing their bit" in co-operating in every possible way with the Federal government and should at the same time continue to use their every influence toward urging the speedy construction of hard-surfaced roads between our largest cities during the spring of 1918.

### County-Owned Outfits

Recognizing the advantages of motor trucks, Escambia County, Florida, and Warren County, Mississippi, purchased two Kelly-Springfield dump body trucks. The variety of uses to which these trucks have been put would have been almost unbelievable five years ago. Beginning with the first operation in road-building they draw the grader in opening up the side ditches and grading the roadway. They haul the material and draw the roller with which it is rolled. They bring all equipment to the work and carry the workmen back and forth to the job. They are on the job from breakfast until the whistle blows at night and these counties say they are a good investment.

### Woman Is Successful Contractor; Hubby at War, She Builds Roads

Woman's infinite capacity has been put to all sorts of tests by the world war. In Europe, women have taken up work which no one ever dreamed they were fitted for; in the United States we have yet to accustom our vision to women employed as motormen, engineers, and at other occupations involving heavy labor.

Experience in Europe has proven that when women have been needed to take the place of the men called to the colors, they have adapted themselves to totally unaccustomed tasks.

About the last thing one would suppose a woman could fit herself for is the operation of a heavy motor truck and road-building machinery. But it occurred to a member of the National League for Women's Service and the White Company to demonstrate that such work was not beyond the realm of possibility.

Incidents forming a basis for the demonstration were suggested by the experience of a contractor who, shortly after securing a contract for road construction, was drafted. His experience and his wife's timely aid gave the idea for a moving-picture scenario, which the League will screen throughout the country as an example of what American women can do to aid their country and release men for the military service. The synopsis is as follows:

F. H. Davis, a young contractor living in Fresno County, Cal., secures a fifty-nine-thousand-dollar road contract and they are in high feather over the success of his bid. He starts his job with enthusiasm. A few days later when his wife, Hazel, takes his lunch to him, she also takes a letter which has just arrived. The letter is a draft notice, summoning him to camp.

Davis is anxious and determined to serve his country, but is distressed by the prospect of being forced to abandon his road contract. The perplexity of his problem is suddenly lifted by the inspiration of his wife. Hazel ventures the suggestion that she can learn to operate the big White five-ton truck and road machinery and carry the contract to a successful finish.

Hazel dons her husband's overalls and jumps on the truck. Davis shows her how to operate the different levers, and she drives off. After a few days' coaching she proves her ability to handle the machinery and boss the job. Davis leaves for war.

Hazel's crew is at first inclined to loaf on the job and take advantage of the "woman boss." But she does not countenance "slackers."

While her husband is being turned into a first-class fighting man, Hazel goes on steadily with the work. She received the first payment on the contract—a check for ten thousand dollars. She takes time to go to camp to see her husband. She drives up in her car and is halted by a sentry. She discovers her husband sitting in a near-by tent and hails him. Davis runs out and embraces her, then inspects the car and endorses the contract check. She gives him a ride in the new car and bids him goodbye. The last scene shows Davis in a parade of troops about to entrain for France and Hazel appears in a nearby window, bravely waving him adieu.

### Trucks for Every Purpose

The United States Motor Truck Company has been manufacturing trucks for nine years and have them in use in practically every line of business. One of their five-ton dump-body trucks is earning its way and speeding up the job for the Keystone State Construction Company, of Philadelphia, engaged in excavating work on the new subway in that city. They make worm-drive trucks from two and one-half to five tons and chain-drive from two and one-half to three and one-half tons capacity.

### One Driver Operates Two Trucks

Poor railroad facilities in delivering material to be used in the construction work they were finishing on three small jobs in and near Jamestown, Ohio, made the constant, and therefore efficient and economic, use of two seven-ton, dump-body Sterling trucks, owned by McGaray-Sparks Contracting Company, impossible.

As an emergency expedient, and endeavoring to keep operation costs as low as possible, they employed but one driver in charge of both trucks. They do not, of course, advocate this practice as a method to be employed for securing economic and efficient results in the use of motor trucks, but under the conditions as outlined have found the plan very satisfactory.

The three contracts referred to are, one-half mile of macadam construction, consisting of two four-inch courses, top course Glutrin bound, finished with a sur-

face treatment of Trinidad Liquid Asphalt and pea gravel, and two thousand feet of combined curb and gutter, in the village of Jamestown, Ohio; a contract for hauling the stone and screening for the construction of a three-mile stretch of macadam road being built by the township with a county-owned outfit; and the finishing of berms, culverts, and short pieces of macadam over new culverts on Inter-County Highway No. 29 between Xenia and Jamestown, which was built last year. In addition to the above, they have also used the trucks in hauling pea gravel for maintenance work now being done on Inter-County Highway No. 29 between Jamestown and Washington, C. H., Ohio.

The screenings for these jobs is placed at the side of street or road before any stone is placed. The unloader is not being used for either the screenings or pea gravel, nor for the sand and gravel used in the curb and gutter work. These were shoveled direct from the cars into the trucks and while one is being loaded the driver takes the loaded truck to one of the jobs.

The haul for the street job is about one-half mile. ered six yards of material on the street, dumping so as to require practically no spreading, every twelve minutes. A Galion Unloader is being used for transferring the coarse stone from the cars to the trucks and as one truck is pulled under the chute of the unloader the driver steps on the loaded one ready to be taken to the job.

### The Advantage of Modern Road Hauling

Mr. Robert W. Davis, County Engineer and Superintendent of Fayette County, Kentucky, has the following to say regarding the use of motor trucks and trailers in county road construction and maintenance work:

"A few years ago the cost of hauling over country roads was thought to be well established for ordinary conditions. Accurate cost data collected under varying conditions established a reasonable accurate ton-mile estimating cost of hauling with teams as varying between twenty (20) to thirty (30) cents. New developments in machinery have, however, placed at the disposal of the Road Engineer and Contractor other methods of hauling, which, under proper conditions, are much more economical than team hauling."

"The steam and gasoline tractor with wagon trains, the motor truck alone, or with trailers, each having a definite field in which their use results in a saving over any other method that might be employed. In selecting between these classes of mechanical powers, the roads they are used over must be considered. The truck being built for speed as well as power, on favorable roads, can cover twice as much ground per day as the steam or gasoline tractors."

"The following will show the accomplishments per day of a White Good Roads Truck and two Troy Trailers operated on Fayette County, Kentucky, roads. I have not figured the depreciation and interest on investment involved, but just intend to show a day's work done by a modern road-hauling train."

"February 16. Truck alone. Covered 56 miles; hauled 18 tons. Cost for operations, $6.73. (Gas., 18 gal. at 12 cts.; 2 men, $4.25; oil, 32 cts.) Cost per ton-mile, 6.6 cents."

"February 17. Truck and one trailer. Covered 48 miles; hauled 31½ tons. Cost of operation, $7.61. Cost per ton-mile, 5 cents."

"February 18. Truck and two trailers. Covered 48 miles; hauled 45 tons. Cost for operation, $8.73. Cost per ton-mile, 4 cents."

"You will notice where one trailer was used 13½ tons were delivered for 88 cents, and where the two trailers were used 27 tons were delivered for $2.00. If the last days' hauling had been by teams at $3.50 per day it would have taken 15 teams, costing $52.50 as to $8.73 for truck and trailers; making $43.77 for county in one day. The trailers used were Troy truck 4-yard trailers. Since we can see the efficiency of any hauling outfit is in proportion to its ability to deliver material cheaply."

### Truck Displaces Seven Teams

Louis Hoffman, of Grafton, Wisconsin, has a three and one-half ton Acme truck in service. In hauling crushed stone for a State road job at Belgium, Wisconsin, this truck is actually doing the work of seven teams. Over a four and one-half mile stretch of road it makes eleven trips a day, carrying three yards at each trip, or a total daily tonnage of thirty-three yards of crushed stone. Teams on the same work are making but three trips, carrying one and one-half yards each trip, or four and one-half yards a day. The truck not only displaces seven teams but also seven drivers, and releases that much equipment for other work. When not in use on road work Mr. Hoffman used this truck for moving freight and hauling coal.

### Cost Data on County and City Owned Trucks

The following reports are furnished by the County Engineer of Black Hawk County, Iowa, and the City Engineer of Lansing, Michigan:

### Office of County Engineer, Waterloo, Iowa, Report on Work of Duplex Truck for Black Hawk County, Iowa

June 25, to December 1, 1917.
3½ Ton Duplex Truck.
Put in operation June 25, 1917.
Cost of Outfit, $3,800.
Weight of Outfit, 8,815 lbs.
Weight of Two Men Operating, 330 lbs.
Miles operated, 6,783.

| | Cost. |
|---|---|
| Lubricating Oil used, 84 gal. | $ 50.20 |
| Hard Oil used, 61.6 lb. | 7.36 |
| Gasoline used, 1,843 gal. | 436.02 |
| Miscellaneous Repairs (No Labor) | 27.25 |
| Tools, Storage, Registration fee, Canvas Covers, Chains, etc. | 82.87 |
| Labor men on repairs, adjusting, oiling, greasing, etc. | 148.10 |
| Total | $751.81 |
| Miles per gal. gasoline | 3.68 |
| Cost per mile of oils and gasoline | $0.0728 |
| Total cost per mile of operation | .11083 |

The truck has been used for hauling materials for concrete culverts, lumber for bridge repairs, gravel and clay for road repairs, and hauling our "Uncle Jim" Leveler on road repairs.

It has a convertible box with side dumps for gravel hauling, the "A" shaped center opens up and the two parts fasten against the sides of the body, making a box suitable for general hauling.

The box holds 2.4 cubic yards gravel level full, 3 cubic yards heaped 4 inches, and 3.5 cubic yards heaped 8 inches. The top of the box is 6 ft. 1 inch above the ground and all gravel hauled this season was loaded by hand by the two men who operated the truck. The man in charge was paid $0.55 per hour and his helper $0.30 per hour.

The following shows what was done with the truck during the period shown: Since December 1, we have been hauling gravel for road repairs with a 1½ yard trailer attached. The bills for materials used had not all come in January 1, so no attempt was made to include this work in this report. It will be included in 1918 costs.

The truck worked on 71 concrete culverts 2x2—20 ft. to 6x4—20 ft. It hauled 632 yards gravel, was

operated 2,660 miles in doing so, and the labor cost was $444.40; 7,086 sacks cement were hauled using 1,626 miles and a labor cost of $241.15; 68,242 pounds of steel were hauled using 688 miles and a labor cost of $65.52; the culvert was moved 52 times using 173 miles; 560 3x12—16 ft. planks were hauled for temporary bridges over culverts; culvert stripping and hauling of form lumber used up 1,036 miles, and a labor cost of $157.28. On bridge repairs 280 3x12—16 ft. and 20 3x12—20 ft. plank were hauled (a small part only were placed by the truck crew), 260 miles were used up and a labor expense of $42.08 incurred. On road repairs 99 yards gravel and clay were hauled onto roads, using 409 miles and a labor cost of $85.27; 22½ miles were dressed with our "Uncle Jim" Road Leveler, using 104 miles and a labor cost of $30.60.

The following are the average speeds that could be made to the best advantage on good roads: Running empty, 12 to 15 miles per hour; hauling gravel with 3 yard load, 8 to 10 miles per hour; hauling cement, 40 to 90 sacks, 8 to 10 miles per hour; moving culvert outfit, 4 miles per hour.

The above data is taken from records in my office and no items of expense have been omitted other than depreciation and interest on investment.

Respectfully submitted to those interested,

COUNTY ENGINEER.

## New Hydrated Lime Plant

June 1 marks the opening of the new Buffalo (N. Y.) plant of the Kelley Island Lime & Transport Co., of Cleveland, Ohio. The new plant is located on Buffalo Creek Railroad, with docking facilities that will accommodate the largest lake vessels. Some of the latest machinery for the purpose has been installed in the new plant.

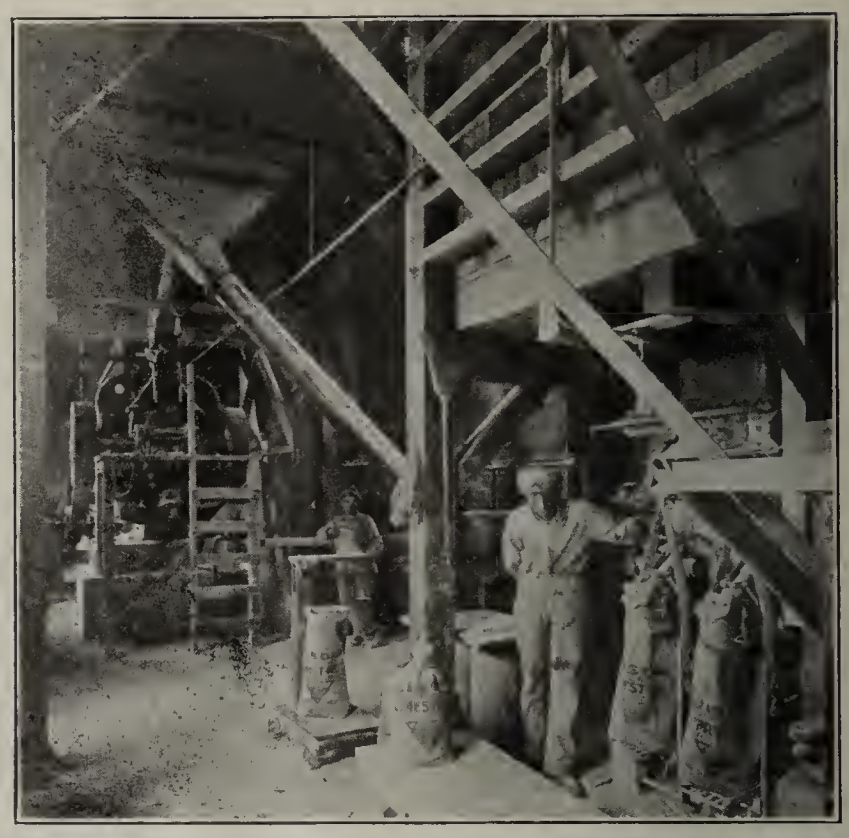
Production will include agricultural pulverized and agricultural hydrated lime, lump and hydrated lime for

View of Plant and Dock at Buffalo

building purposes and chemical lime. Limestone will be brought from the company's high calcium field in northern Michigan by boat, and also from the company's quarries at Kelley Island, near Sandusky, Ohio.

The docking facilities and handling machinery will

In the Foreground Is Shown a Portion of the Plant Under Construction



Interior of New Kelly Island Lime Plant at Buffalo. Herewitht are shown bags being filled witht Pulverized Agricultural Limestone

make it possible to stock enough stone during the summer months to operate the year around. Shipments are assured, as far as railroad lines are concerned, for the location of the plant on Buffalo Creek Railroad makes it possible to ship on any of the lines leading out of Buffalo. This will be of particular advantage to the company in serving customers in central and western New York state and western Pennsylvania.

This plant already is producing pulverized limestone and will be manufacturing lime within a few weeks.

The addition of this factory gives the Kelley Island ten lime producing plants in addition to its several stone plants.

In the new Buffalo establishment are 196 upright kilns and three rotary kilns, giving an annual capacity of six million barrels of lump lime, probably the largest output credited to any one similar concern in the world. All told, this project will cost $1,000,000 when completed.

O. H. List, formerly representative of Kelley Island in western Pennsylvania, has been made district sales manager in New York state.

He will have charge of the sales of the product from the new Buffalo plant, as well as directing the marketing of the product of the Ohio plants of his firm in his new territory. This will embrace all three divisions of the product, agricultural, building and chemical. Mr. List will make his headquarters at Buffalo after June 1.

## Moving a Concrete Culvert 1,000 Feet

A rectangular reinforced concrete culvert 4 ft. wide and 6 ft. high inside and 24 ft. long, which, with its monolithic wing walls weighed about 70 tons, was recently moved 1,000 ft. to a new site in Shelby county, Iowa. Excavation was made around it and the culvert was reinforced by five temporary yokes made with wooden top and bottom beams connected by pairs of 1-in. vertical bolts.

About twenty-four 20-ton jackscrews placed under the bottom of the culvert were required to lift it. It was raised above the surface of the ground and lowered to bearing on sets of rollers.

Concrete Storage of Quaker Oats Company Nearing Completion—Moving Forms Electrically Lighted—Leonard Concrete-handling System and One of the Mixer Plants.

## Construction of 2,000,000 Bushel Grain Storage

Two million bushels of grain can be stored in the new concrete tanks recently completed by the Quaker Oats Company at Cedar Rapids, Ia. This is an addition to existing storage facilities, and brings the total storage capacity up to 6,000,000 bushels at the Cedar Rapids plant.

The earlier types of storage were of wood and tile, but in this last addition, and in preceding ones aggregating 750,000 bushels, concrete was used exclusively.

Construction of the new concrete storage was done by the Leonard Construction Company of Chicago, under the engineering supervision of H. H. Hadsall. As is the case in successful building of such tanks generally, the work progressed night and day throughout the time after the substructure was completed. Aside from any ordinary demand for speed, it is necessary to work rapidly in order to obtain the greatest structural integrity possible, for the tanks when filled with grain, are subjected to great stresses, similar to hydraulic pressure. Therefore, it is necessary that the concrete work be of the best. During the work there was never more than one hour lay-off between concrete at any point.

Two mixing plants, employing Austin "Cube" mixers, were employed, one on each side. One of these plants was supplied with material by rail, and had ample storage space adjacent. The other plant, on the street side, had limited storage space and was supplied with materials entirely by motor truck. Northwestern States portland cement was used throughout.

The foundation excavation was in solid rock, on one side to a depth of 10 feet. This forms a basement beneath the tanks.

There are 51 tanks, 21 feet in diameter, rising to a height of 102 feet. On top is the Monitor roof extending over all the tanks and equipped with Weller Manufacturing Company belt conveyors for grain handling. The walls are 7 inches thick, heavily reinforced with ¾-inch round rods at the bottom to ⅜-inch round rods at the top, which were furnished by the Bethlehem Steel Company.

Moving circular wood forms were used, supported on steel rods and held together by yokes, so that no ties or anchorage was necessary through the concrete. Jacks were clamped to the rods and arranged to climb on the latter and raise the forms. Floors at the bottom of the tanks and also at the top, which latter carries the monitor, were cast of concrete.

In these 51 tanks there are approximately 12,500 cubic yards of concrete—1-2-4 mix. The walls are perfect cylinders, with no lips or bulged surfaces.

Hydrated lime was used for waterproofing and also to facilitate pouring the concrete and lifting the forms, owing to its lubricating properties. In mixing, 25 pounds of hydrated lime was put into each batch, which made the percentage of lime to cement a little over 8% by weight. The mixers used were of such size that three bags of cement could be used in each batch.

Considerable credit is given by the construction company to the lime. The statement is made that the lime gave the exterior surface a white and uniform appearance, and that the surface needed no subsequent coating. There were no joints where the concrete stuck to the forms and "lifted," as it does in many cases where the concrete is not of uniform mixture.

As the work was carried on at night as well as in the daytime, ample arrangements were made for lighting, as shown to advantage in one of the illustrations. The lights shown in the picture are principally incandescent lamps supported and carried up by the moving forms. A few flood lights were also used at various points.

# Recommended Practice for Concrete Bridge Construction

The following general specifications have been prepared by the engineers of the Portland Cement Association. They are based on the recommendations of the Committee on Bridges of the American Concrete Institute and on parts of Bulletin No. 10 of the Illinois State Highway Department, "A Manual for County Superintendents of Highways, Resident Engineers, and Inspectors."

## Materials

**Cement**—The cement should meet the requirements of the current standard specifications for portland cement of the American Society for Testing Materials. Adequate provision should be made for storage of cement on the work and for protection against dampness in storage.

**Aggregates**—Before aggregates are delivered on the job contractors should submit to the engineer a 50-lb. sample of each of the aggregates proposed for use. These samples should be selected so as to represent fairly the average quality and grading of the aggregates in question. The samples submitted should be tested and, if found to pass the requirements of the specifications, similar material should be considered as acceptable for the work. Aggregate containing frost or lumps of frozen materials must not be used. Fine and coarse aggregate should not be piled so near each other that the edges of the piles overlap. Aggregate should preferably be stored on a platform so that the material in the bottom of the pile will not become mixed with dirt during wet weather, thus lowering the strength of the concrete.

**Fine Aggregate**—Fine aggregate should consist of natural sand or screenings from hard, tough, crushed rock or pebbles, graded from fine to coarse, with the coarse particles predominating. Fine aggregate when dry should pass a screen having 4 meshes per linear inch. Not more than 25% should pass a sieve having 50 meshes per linear inch, and not more than 6% should pass a sieve having 100 meshes per linear inch. Fine aggregate should not contain injurious vegetal or other organic matter, as indicated by the colorimetric test,* nor more than 7% by volume of clay or silt as determined by washing the sand thoroughly in 100% excess of water and allowing the silt to settle for one hour. Field tests should be made by the engineer on the fine aggregate as delivered at different times during the progress of the work. If the above requirements regarding organic matter and silt are not fulfilled, the material represented by the samples should be rejected.

*The colorimetric test is described fully in Bulletin No. 1, entitled "Colorimetric Test for Organic Impurities in Sands," issued by the Structural Materials Research Laboratory, Lewis Institute, Chicago. This bulletin may be obtained from the Portland Cement Association.

Fine aggregate should be of such quality that mortar composed of one part of portland cement and three parts fine aggregate, by weight, when made into briquettes or cylinders, shows a tensile or compressive strength at 7 and 28 days at least equal to the strength of briquettes or cylinders composed of one part of the same cement and three parts of standard Ottawa sand by weight. The proportion of water used in making the test pieces of cement and fine aggregate should be such as to produce a mortar of the same consistence as that of the Ottawa sand test-pieces of normal consistence. In other respects briquettes or cylinders should be made in accordance with the methods of testing cement recommended by the American Society for Testing Materials.

**Coarse Aggregate**—Coarse aggregate should consist of clean, durable, crushed rock or pebbles graded in size, free from vegetal or other organic matter and should be practically free from soft, flat, or elongated particles. The coarse aggregate should be well graded from 1½ in. down (1 in. for reinforced concrete), not more than 5% passing a screen having four meshes per linear inch.

**Rubble Stone**—For mass work "one-man stones" may be embedded in the concrete provided that they are not placed nearer than 6 in. to the outer surface of the concrete and not closer to each other than 6 in. The quantity of such stone should not exceed 30% of the cubical content of the wall or foundation.

**Mixed Aggregate**—Crusher-run stone, bank-run gravel or mixtures of fine and coarse aggregate prepared before delivery on the work should not be used, because the ratio of fine to coarse material varies so widely as to lead to mixtures of greatly varying proportions.

**Water**—Water should be clean and free from oil, acid, alkali, or vegetal matter.

**Reinforcement**—Reinforcing metal should meet the requirements of the current standard specifications for steel reinforcement of the American Society for Testing Materials. It should be free from excessive rust, scale, paint, or coatings of any character that would tend to reduce or destroy the bond. Either plain or deformed steel bars should be used unless otherwise specified by the engineer. When deformed bars are used they should have a net cross-sectional area equivalent to that of the plain bars shown on the plans. All reinforcing metal should be so stored and handled at the work as to ensure its being placed in the structure in a clean condition.

**Joint-Filler**—The expansion-joint filler should be either a suitable elastic waterproof compound, which will not become soft and run in hot weather, nor become hard and chip in cold weather; or else prepared strips of fibre matrix and bitumen as approved by the engineer.

## Construction

**Forms**—Forms should be substantial, unyielding, and so constructed that the concrete conforms to the designed dimensions and should also be tight to prevent leakage of mortar. The forms for exposed surfaces should be sound lumber, planed to a uniform thickness, either tongued and grooved, or with edges beveled to make tight joints after erection. Special attention should be given shores for beams, girder, and slab work, wall-ties, bracing for walls, and centring for arch-form supports, in order to ensure the completion of the work without sagging and deformation. The supports for bridge floors, beams, girders, and arches should remain in place until time for removal, as hereinafter recommended. Forms should be filleted at all sharp corners. For all projections such as girders and copings, the forms should be given a bevel or draw sufficient to ensure easy removal. Forms should be painted with boiled linseed oil or other equally good preparation to prevent the concrete from adhering to the same. A coat of ordinary whitewash is effective. Crude oil or any material that will stick to or discolor the concrete, such as tar paper, should not be used. Care should be taken to secure perfect alignment of rail and girder forms. Local kinks should be eliminated before the concrete is placed.

**Placing Reinforcement**—Reinforcement should be placed in the position shown on the plans and should be wired at intersections so that it will not become disarranged during the depositing of the concrete. Where bars are spliced, a length of lap sufficient to develop the full strength of bar should be used. If

clips of an approved design or other method of connecting rigidly the bars of a reinforcing member be used, the length of lap may be decreased an amount depending upon the nature of the connections. Splices at points of maximum stress should be avoided. Steel should not be laid directly on forms and raised during placing of concrete by prying it up and working concrete under it. The steel should be laid on small stones or blocks of concrete, which may remain when the concrete is placed. In general, steel should be placed securely before concrete is deposited.

### Measuring and Mixing

**Measuring**—The method of measuring materials for the concrete or mortar, including water, should be one that will ensure separate and uniform proportions of each of the materials at all times. Uniformity of proportions for the aggregates can best be maintained by the use of bottomless measuring boxes or wheelbarrows whose capacities have been determined. A sack of portland cement (94 lb. net) should be considered as one cubic foot.

**Machine Mixing**—Concrete should be mixed by machine except when the engineer permits otherwise under special conditions. A batch-mixer of an approved type should be used. The ingredients of the concrete or mortar should be mixed to the specified consistence. The mixing should continue at least one minute after all materials are in the drum before any part of the batch is discharged from the drum. The drum should be emptied completely before receiving materials for the succeeding batch. The volume of the mixed material used per batch should not exceed the manufacturer's rated capacity of the drum in cubic feet of mixed material. The mixer should be equipped with water storage and a measuring device which can be locked, also with a suitable charging-hopper.

**Hand Mixing**—When it is necessary to mix by hand, the materials should be mixed dry on a water-tight platform until the mixture is of uniform color, the required amount of water added, and the mixing continued until the mass is of uniform consistence and is homogeneous. The concrete should be placed in the work within 30 minutes after the water is added to the dry materials.

**Re-tempering**—Re-tempering of mortar or concrete that has hardened partly, that is, re-mixing with or without additional materials or water, should not be permitted.

### Gravity Abutments, Wing-Walls, and Piers

**Proportions**—Concrete for abutments and wing-walls should be mixed in the proportions of one sack of portland cement to not more than two and a half cubic feet of fine aggregate and five cubic feet of coarse aggregate.

**Consistence**—Sufficient water should be added to the dry materials to produce a concrete of a consistence such that it will flow slowly into the forms, but can be handled to place without a separation of the coarse aggregate from the mortar. This consistence is best described as "quaky."

**Placing**—Concrete should be placed in a manner that will permit the most thorough compacting and should be worked and spaded into all recesses of the forms. Concrete should be deposited in its final position as soon as possible after mixing and before it has begun to harden. When the work is interrupted so that the last layer of the concrete has hardened before the next can be applied, the upper surface should be left level, roughened, and cleaned, and should then be covered until the work is resumed, at which time the surface should be cleansed of all foreign material and laitance, then drenched with a mortar consisting of one sack of portland cement and two and a half cubic feet of fine aggregate. The concrete should be placed in continuous horizontal layers. Vertical joints should be avoided whenever possible. Concrete should never be placed in running water. In still water a tremie or other apparatus that will ensure the placing of the concrete without separation of the cement and aggregate and the formation of an injurious amount of laitance should be used. Concrete should never be placed in water when it is possible to avoid so doing.

### Arches, Bridge-Floors, Beams and Girders, Reinforced Cantilever-Type Substructure

**Proportions**—Concrete should be mixed in the proportions of one sack of portland cement to not more than two cubic feet of fine aggregate and four cubic feet of coarse aggregate.

**Consistence**—Same as under "Gravity Abutments."

**Placing**—Concrete should be placed in a manner to ensure a smooth surface next to the forms and should be spaded thoroughly and worked around the metal reinforcement and into the recesses of the forms. If possible, concrete for an arch-ring should be deposited in a single run. Large arch-spans, where it is impossible to cast the arch-ring continuously, should be divided into transverse sections, care being taken that the bulkheads dividing the sections are placed radially. Concreting should then start at the crown or springing-lines and should be done simultaneously or alternately in such sections as will nearly balance the load and thrust and thus prevent distortion of the form work and supports. If possible, the entire floor should be placed in one day. If not, the dividing line should be made in a vertical plane, perpendicular to the main reinforcing-rods (in slab-bridges at right angles to the axis or roadway and in floors of girder-bridges parallel to that axis). Concrete should be deposited to the full thickness of the floor and should be brought to the surface of the established grade of the bridge-floor. Workmen should not be allowed to walk on the freshly-laid concrete.

### Surface Finish

The top surfaces of all walls, abutments, girders, slabs, hand-rails, and copings should be tamped carefully and thoroughly. The top surface of abutments, hand-rails, and copings should be given a slightly arched contour, obtained by striking off the concrete in the forms with a strike-board cut to give this surface the desired contour. Concrete in floor-slabs that are to serve as the finished road surface should be compacted by rolling with a finishing-roller similar to the Macon concrete-paving roller.† Immediately after the forms have been removed, projections and irregularities on exposed surfaces should be removed and cavities neatly filled with mortar. Enough 1:2 cement-and-sand mortar should be used to fill the cavities, but no plastering should be permitted. All exposed surfaces should be finished to give a smooth and neat appearance, and when specified should be scrubbed or otherwise finished in an approved manner as directed by the engineer. The bridge-floor, after being brought to the established grade and struck off with a template or strike-board, should be finished with a wooden hand-float in such a manner as to compact it thoroughly and produce a surface smooth and free from depressions.

**Protection**—Surfaces should be protected from sun and wind and the concrete sprinkled in dry weather so that the whole surface is kept wet for a period of at least one week. Floors should preferably be covered with damp earth, which should be kept wet by frequent sprinkling for at least ten days or until thorough hardening of the concrete is ensured.

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†A circular describing this roller and the method of using it can be obtained from Portland Cement Association.

**Temperature Below 35° F.**—If at any time during the progress of the work the temperature is below, or in the opinion of the engineer will within 24 hours fall to, 35° F., the aggregates and mixing water should be heated and adequate precautions taken to protect the work from freezing for at least seven days.

**Hot Weather**—Freshly placed concrete exposed to hot weather and strong sunlight should be protected by watering the surfaces frequently and covering for seven days after being placed.

**Removal of Forms**—No forms should be removed within 48 hours after concrete is placed. Supports for floors, slabs, and bridge-arches should remain in place at least 21 days. When freezing weather occurs the supports should remain in place for an additional time equal to the time the structure has been exposed to freezing temperatures. No extraneous loading should be placed on the concrete before removal of the forms. The bridge should not be opened to traffic until the engineer directs.

**Filling Against Walls and Arches**—Earth filling against abutment, wing, and spandrel walls should be placed in horizontal layers, avoiding wedge-shaped sections against the walls. Arch-fillings should be deposited in such a manner as to load the arch symmetrically. The filling back of abutments and between spandrel walls should be drained thoroughly by means of drainage lines and scuppers through wing-walls, arch-rings, and piers.

**Drainage of Floors**—The floors of all slab and girder bridges should be provided with suitable drain-scuppers at frequent intervals.

**Coffer-Dams**—Coffer-dams should be constructed as nearly water-tight as practicable. No pumping should be permitted inside of foundation-forms while concrete is being placed. Should it become necessary to prevent flooding, a seal of concrete may be deposited in the bottom of the coffer-dam and allowed to set. Methods of depositing concrete must be such as to ensure that there shall be no separation of materials. If closed chutes or troughs are used, these should never be set at so flat an angle that it will be necessary to use a concrete of wetter consistence than that required for best results. Arch-foundations on piling should be enclosed in permanent continuous sheet-piling, having the tops sawed off one foot below low water.

## Foundations

**Excavation**—All footing excavations should be carried down to firm material except where the sub-foundation material is known to be soft enough to require the use of piles or other special treatment.

**Load on Footings**—The footings shown on plans prepared by the Illinois Highway Commission are spread to such an extent as to make the average bearing on the sub-foundation material not more than 1½ tons per square foot of footing-area. This load is safe for ordinary material such as firm clay, coarse sand, gravel, or even moderately compacted made ground. It is not an overload for confined sand, provided there is no danger of the stream-bed scouring so as to release the sand or undermine the footings. Saturated sand, however, flows readily if unconfined. Sandy stream-beds are frequently subject to local scour which may endanger the foundations. Local scour 8 to 10 ft. below the stream-bed, because of some obstruction such as driftwood or a sharp change in the course of the current, is not uncommon. Scour 20 ft. deep has been known. Abutment and pier foundations in sandy soils should therefore be designed with this danger in mind. Driving piles in sand with the aid of a water jet is not difficult and affords a fairly economical means of providing for such conditions.

**Subsoil Tests**—When the excavation is carried nearly to the depth called for on the plans, soundings should be made by driving a rod in the bottom of the excavation, or, preferably, test-pits should be dug to determine the character of the underlying material.

**Extra Footings**—It is not usually economical to carry the footings to a depth greater than 3 ft. more than that shown on the plans, as the contract price for extra concrete in footings is usually high. If firm material cannot be secured at a depth 3 ft. or less below that shown on the plans, it is usually more economical to drive piles.

**Bracing Pits**—In making excavations under ordinary conditions, the sides of the excavation if vertical, and more than five or six feet high, are apt to cave unless thoroughly braced. It is usually cheaper and undoubtedly safer for the contractor either to excavate in the first place to a 1 to 1 or flatter slope or else to arrange to brace the trench thoroughly.

## Piles

**Load on Piles**—When piles are used, it is good practice to drive a sufficient number to carry the entire load, including live load and weight of bridge complete, so that the abutment will be stable even should scour remove part of the soil from underneath the footing.

**Test-Pile**—Should circumstances permit, a test-pile may be driven before the piles are ordered. The test-pile should ordinarily be not less than 20 ft. long. During driving, the necessary observations should be made for the determination of its supporting capacity by the Engineering News' formula. Using the results so found, the number and length of piles may be determined.

**Pile-Spacing**—In planning the position and spacing of the piles, it is well to hold in mind that under ordinary circumstances piles cannot be driven closer than 2½ ft. centre to centre. If attempt is made to drive piles closer than this, the last pile driven is likely to raise all of the piles already driven an amount approximately equal to the displacement of the pile under the hammer. If a greater supporting capacity is required, the footings should be spread in order to accommodate more piles, or else longer piles should be used. Ordinarily, the minimum spacing should not be less than 3 ft. centre to centre. In general, a greater number of piles should be placed under the stream-side than under the land-side of the abutments. Not more than one-half the diameter of the pile should project beyond the neat lines of the abutment wall proper unless the footings are reinforced properly. The piles should extend into the foundation from 6 to 9 in. Concrete should be placed around the tops, bedding them from 6 to 9 in. in the concrete when the work is finished.

## Concreting Footings

**Inspection of Completed Excavation**—An inspector should be on the work when the placing of concrete in the footings is started in order to be sure that the sub-foundation material is satisfactory and that the footing-concrete is properly placed. The bottom of the excavation should be clean and as free from soft material as possible.

**Tempering Footing-Concrete**—Dry concrete should never be placed in footings, even should the excavation contain considerable water. If concrete is placed dry, it is likely to become wet only on the surface, leaving most of the concrete dry.

**Placing Concrete in Footings**—If there is trouble from an excessive amount of water draining into the pit, care should be taken to prevent the cement from being washed out of the concrete and carried off with the water removed by the pump. If there are no steel rods to interfere, the footings should be carried forward to the full depth from one end of the trench toward the pump.

Reinforced Concrete Bridge at Piqua, O.

**Use of Tile**—It may be necessary to lay a line of tile around the edge of the excavation to take the water to the end where the suction of the pump is placed. Concrete may then be placed, beginning at the opposite end from the pump-suction, finally stopping the pump and filling the pocket or sump at the point of suction. This layer should be allowed to harden for 24 hours or more before pumping out the excavation again.

### Reinforced Footings

**Placing**—In reinforced concrete footings a layer of concrete should usually be deposited as far as the elevation occupied by the lower bank of horizontal rods. These rods should then be placed with the vertical bars hooked around them and supported temporarily, and the next layer of concrete placed immediately before the lower layer has had time to set. The top rows of bars should then be placed and the footing-concrete completed before any of the concrete hardens, working from one end of the abutment toward the other. If there is much trouble from water in the pit, it may be necessary to support all of the footing-steel rigidly in place before any concrete is placed. This is good practice in any case.

**Supporting Steel**—Projecting ends of reinforcing-

Views of the Shawnee Bridge on Union Street Over the Great Miami River, in the City of Piqua, Ohio. It is a reinforced concrete arch bridge of five spans of 94 to 110 feet each, erected in 1914 by the Hackedorn Contracting Company of Indianapolis, Indiana, on plans supplied by Daniel B. Luten, Consulting Engineer of Indianapolis. The roadway is 50 feet wide including the two walks. The lamp posts are of reinforced concrete. The bridge was designed for uniform loading of 150 pounds per square foot or concentrated load of 20 ton road rollers. The contract price was $94,000.00.

bars should be supported rigidly so as to avoid danger of the bond being loosened. This applies particularly to the vertical bars in abutments, wings, and to stirrups in the girders. Thrusting bars to place in concrete that has attained initial set should not be tolerated.

**Placing Steel**—Care is necessary in placing in exact position footing-bars and the vertical bars that project from the footing as the section of greatest stress in a cantilever type of retaining wall is at the top-surface of the footing and the part of the vertical bars below this section must therefore provide sufficient bond to develop the full strength of the bar.

### Falsework

**Mudsills**—Falsework for supporting the superstructure of concrete bridges should be designed, if on mudsills, so that the sills have a sufficient bearing area to carry the weight of the superstructure without appreciable settlement. Not more than two tons per square foot of bearing area should be permitted for such sills on good material. A higher allowance may be made on firm hard material or gravel. On soft material the bearing pressure should be reduced by increasing the dimensions of the sills, or preferably piles should be driven to support the falsework, or possibly concrete footings placed.

**Concrete Falsework-Sills**—Contractors frequently find concrete footings for falsework to be advantageous. These may be constructed of lean concrete, but they should have ample area to carry the weight of the falsework and superstructure. Plenty of time should be allowed for the concrete to harden.

**Stresses in Falsework**—In order that undue deflection or crushing of the caps, stringers, and sheeting for the superstructure-concrete may be avoided, the following stresses should not be exceeded for yellow pine or oak timber.

Fibre-stress in cross-bending, 2000 lb. per square inch.

Crushing across the grain, yellow pine, 600 lb. per square inch.

Crushing endwise of the grain for short blocks or stiff columns, 4000 lb. per square inch.

Long posts must be braced in both directions. The unsupported length in any direction should not exceed 15 diameters of the stick. All of the above stresses should be reduced one-half for green timber and for sapwood.

# Utilization of Waste Heat in Sand-Lime Brick Plants—Fuel Economy Is One of the Prime Essentials in Present-Day Manufacturing

By J. Morley Zander, Secretary and General Manager, The Saginaw Brick Co., Saginaw, Mich.

The statement is often made that the steam generated at a brick factory and used in hardening cylinders or kettles has done but a small fraction of the work it is capable of doing before it is blown away while still at high pressure. This fact is so generally known that a considerable effort has been made to use this steam from the hardening cylinder to do other work, and where local conditions have been right considerable success has been attained. However, at the plant of the Saginaw Brick Co. some experiments have been conducted for saving at the time the steam enters the hardening cylinder rather than when it leaves.

### How It Was Done

Starting with the knowledge that the greater part of the steam that goes into a hardening cylinder is condensed in sweating the water from the green brick and warming up the cylinder, the conclusion was reached that if this work could be done with exhaust steam, a large saving in fuel could be effected. Accordingly, the engine exhaust pipe was carried over the hardening cylinders and an opening left for each one. From these openings, which are standard 5-in. gas pipe connections, a 5-in. pipe was run into each cylinder by means of a cast steel flange located at the bottom of the back head. This delivers the full volume of exhaust steam underneath the cars of brick. In practice the cylinder is filled with cars of green brick, the head put on and with the blow-off wide open the 5-in. exhaust pipe is turned in. As no pressure can be accumulated on the cylinder because the blowoff is left open, there is a minimum amount of back pressure held against the engine. In a surprisingly short time the cylinder is quite hot and after about two hours the exhaust valve can be closed, also the blowoff, and the live steam turned in. The cylinder will equalize with the boiler in about forty minutes.

The engine in this factory is a 16x20-in., and even with three hardening cylinders connected to exhaust, there is enough steam left to heat the building and some still blowing away through the relief valve. The men in the engine-room are enthusiastic with the method of warming the cylinders as it saves them nearly all of the extra firing formerly required to get up the pressure.

### Heating the Building

The building is heated by a coil type of heater, containing about 1,200 ft. of 1½-in. pipe, and as mentioned, this is supplied during the day by exhaust steam. If the weather is real cold, a small amount of live steam is used in this heater in the fore part of the night, but as soon as a kettle is ready to blow down, it is blown through the heater by partly opening the 5-in. valve that connects it with the exhaust line. This means of keeping the building warm is also used on Sundays if weather conditions are such that heat is desirable. While the method used at Saginaw for hardening cylinders is very simple, and probably has been used by others, it has proven so satisfactory and effected so large a saving in coal that I trust the information in this paper may be of use to some who have felt the increase in the cost of fuel to be a serious burden.

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## Newaygo Potash Plant

Work on the $100,000 potash plant being erected by the Newaygo Cement Company has progressed so rapidly that the company expects to have the plant operating by August 1.

The company will sell its entire output of potash to the government and will continue to manufacture cement, the potash being a by-product. This will incidentally eliminate the dust and smoke. So far as known this is the only potash manufacturing plant in western Michigan.

# Observation on Kiln Practice

By N. S. Potter, Jr., Vice-Pres. & Genl. Mgr., Michigan Portland Cement Co.

Portland cement kilns in the United States are cylindrical and revolve. The raw material is fed in at the upper end and fuel blown in at the lower. These are the only points in which they present any particular similarity. Beyond this the details of their operation present an infinite variety. They differ in length, size, pitch, speed, output, raw material, conditions of combustion, draft, detail of burner and methods of control.

The major things to which we must direct our attention are of course capacity and thermal efficiency, to which the various details above are subordinate. In the past our efforts have been to secure capacity. This must now take second place while we devote our efforts to improvement in the thermal efficiency of our kilns.

It would not be of advantage to go into details as to the reported capacity and fuel consumption of kilns of various sizes. Such a catalogue would not give information upon which improvements could be based, except in small degree. Bare information that a kiln of a certain size performs in a certain way does not add much to our knowledge. We must have complete and detailed information regarding the operation, from which we can study the performance, determine the economy, and find the reasons for good or poor results.

Isolated studies of kiln operation have been made from time to time, and a number of them have been published, and while the individual tests were extremely interesting and valuable, they were of much greater importance in indicating the general lines which the industry should follow if the present wasteful methods of operating are to be discarded.

Some of the work mentioned has been available to the industry for fifteen years or more, yet the individual manufacturers have not apparently appreciated the significance of the results or consistently applied the principles to their own commercial operations. It is a fact more or less freely admitted that cement kilns in the United States are run largely haphazard, and without much knowledge as to what is taking place in them, or whether they are wasting a *very* great deal of fuel or only a great deal.

Such experiments as have been made, and nearly every mill has made some to increase capacity or decrease coal per barrel, have more often than not been attempted without taking into consideration the scientific principles of combustion, or have not been carried out by men with technical training. Many of these experiments have been successful, of course, but the reason for success or failure remained undiscovered.

These matters, and in fact, the whole question of economical kiln operation, have been forcefully brought to our attention by the necessity of conserving coal and our advancing cost in every department of manufacture.

As plants which operate on wet material generally have greater coal consumption per barrel than those operating on the dry system, cost of coal under present conditions makes the subject of kiln economy a very live one. Such conclusions as we have reached with respect to the needs of investigating this subject disclosed that as accurate knowledge as possible would be necessary on the following subjects:

*Raw Material*—Composition, fineness, 100 and 200, and if wet, the content of water, weight per cu. yd. and barrels clinker per cu. yd.

*Kiln*—Size, pitch, maximum and minimum speeds, travel of hearth in ft. per minute and travel per barrel output, thickness of bed of material, thickness, kind and life of lining, output per hour and per day, and temperature of discharged clinker.

*Coal*—Kind, source, average analysis, average B.t.u., fineness 100 and 200, pounds consumed per minute and per barrel, and average B. t. u., per barrel clinker.

*Air*—Quantity required for complete combustion of coal, cu. ft. per minute delivered to kiln through burner, pressure back of nozzle and between nozzle and kiln, velocity in burner pipe, temperature and means of heating if any. Size of other openings into hood, volume and temperature of air entering clinker discharge hole.

*Burner*—Complete description giving size, direction, position referred to center of hood, dimensions of air nozzle, method of control of air and coal, and character and length of flame.

*Draft, and Discharged Gases*—Size and height of stack, draft in inches of water, velocity, temperature and composition of discharged gas, calculation of volume per minute passing up stack, volume of products of combustion and decomposition, and excess air.

The most important single item in kiln study is the subject of combustion, and heat consumption and losses. The total heat delivered to the kiln is roughly divided as follows:

| | |
|---|---|
| Heat necessary for reaction | 20% |
| Escaping through stack | 40% |
| Carried away by clinker | 20% |
| Lost by radiation | 20% |

The loss by radiation apparently cannot be avoided. The heat which is carried away by the clinker can, however, be recovered to a very considerable extent. There are a number of devices in use which accomplish this with more or less success, but there is no question but that very radical improvements can and should be made in the recovery of clinker heat and returning it to the kiln, resulting in increased economy and better combustion. A comprehensive study of the methods now in use would doubtless yield valuable returns to the whole industry.

The escape of heat through the stack is the largest single loss with which we have to deal and appears to be the loss to which the least attention has been paid. Of course a certain loss of heat there is unavoidable as our draft depends upon the column of heated air. The heat loss above a certain minimum temperature can be controlled. The loss from radiation cannot be controlled and is practically unavoidable, therefore, the only place in which heat loss can be reduced is in the regulation of stack losses through gas analysis and temperature readings.

This has been clearly demonstrated in a certain plant where mechanical draft was introduced. At first the stack temperature showed around 1300° F., but by proper attention and regulation this was reduced to 700° F., with actual increase in production, and saving of about 10 pounds per barrel in coal consumption.

It does not seem to be generally appreciated that the capacity of a chimney cannot be increased by carrying the temperature higher than 350° F. The intensity of the draft and velocity of the gases will be increased, but the quantity of gas in pounds will remain practically constant due to the decreased density. Therefore, a high stack temperature does not increase efficiency but operates to carry off heat and increase dust loss.

It may sound revolutionary to some but it is nevertheless a fact that a chemist at the back of a kiln watching the stack temperature reading and the gas analysis is in a better position to tell what is going on in regard to the fire in the kiln than the man in front. It would not indeed, be too much to say that by properly correlating stack gas analysis and stack tempera-

ture readings an absolute check upon fuel waste is obtained.

Note the following analyses:

| | No. 1 | No. 2 | No. 3 | No. 4 |
|---|---|---|---|---|
| $CO_2$ | 19.8% | 22.2% | 22.6% | 7.9% |
| $O_2$ | 3.0 | 0.0 | 0.0 | 13.0 |
| CO | .0 | 2.0 | .6 | .3 |
| N | 77.2 | 75.8 | 78.8 | 78.8 |
| Excess air | 17.3 | —4.8 | —1.4 | 163.5 |
| Temperature | 440° C. | | 420° C. | |

Sample No. 1 was taken from just inside the upper end of the kiln under normal operating conditions.

Sample No. 2 taken a few minutes later after additional coal had been turned on but not enough to make the kiln smoke.

Sample No. 3 taken from another kiln on which the air blast was 30° C., hotter than in the preceding.

Sample No. 4 taken in stack and showing leakage of air through annular opening where the kiln enters back housing. This illustrates the necessity of particular care in taking the sample.

Quite a number of years ago Professor Richards published an article containing very complete and comprehensive data on the heat balance of a rotary kiln. It is evident, however, that the stack gas sample was improperly taken, as the analysis shows an enormous excess of air in the presence of .2% CO, a condition which could not exist at kiln temperature. As his calculations were based on this analysis, he was led into the error of computing his flame temperature at only 1000° C., and assuming that the remaining heat necessary was evolved by the chemical combination of the materials. Subsequent work has demonstrated the error of these conclusions, and shown that sound clinker cannot be produced with a flame temperature of less than 1450° C.

The importance of constant supervision of stack and waste gas conditions does not appear to have been sufficiently emphasized by the various writers on the subject of kiln control. It seems to the writer that in this direction lies the greatest possibilities for increased efficiency.

In conclusion it is evident that we are conducting metallurgical operations with insufficient metallurgical control. In practically no plant are the necessary data available. Each kiln is an individual operation subject to varying conditions from hour to hour. Absolutely efficient control demands that each individual kiln be equipped with revolution recorder, pyrometer, draft gauge, pipe for frequent samples of escaping gases, and apparatus for determining accurately the daily output fuel consumption.

General improvement in kiln practice can be most effectively promoted by earnest and cordial co-operation, making possible intelligent comparison of results. Such co-operation is not without precedent in other industries, as demonstrated by the paper, iron and other interests.

## How to Avoid Losing Money on Concrete

By Henry Ericcson, Builder and Contractor

It will pay contractors who are doing concrete work to adopt a method of estimating in conformity with the Builders' Association rules for measurements of concrete work.

When the average contractor estimates on concrete work he figures up the actual cubical contents of the job and then multiplies this quantity by his unit price per yard—it makes no difference how thin the wall may be or how complicated the form work, he knows that his concreting machinery can turn out a cubic yard of concrete for a given sum and he, as well as his competitors, works under the delusion that concrete in any shape or form can be produced for about $10.00 per cubic yard when, as a matter of fact, there are many cases where concrete is worth more than $50.00 a yard on account of the shape in which it is made.

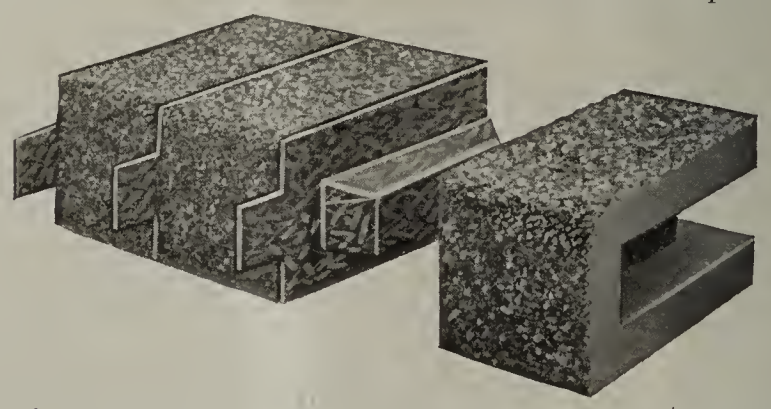
The contractor also has the habit of giving the architect a unit price for additional concrete work. This is all right if he knows what the additional work will consist of, but since the contractor is not a mind reader, he does not know just what shape that concrete is going to take before he gets through with it. Of course, he trusts to luck and the architect that the additional concrete will be of the plain type, but the chances are even that it will be of the fancy and expensive kind.

It is the method of estimating brick work that makes this form of masonry a safe proposition for the contractor. Brickmaking and bricklaying was an old story at the time of Moses, as can be readily recalled from the biblical story of how the Israelites were compelled by Egyptian taskmasters to make brick without straw, and the result of all these centuries of labor is our present arbitrary rule for estimating brickwork. In ordinary brickwork there are actually only 18 brick to the cubic foot of wall but in our estimate we use 21 or 22 brick to the cubic foot. No allowances are made for ornamentations and effects, which require considerable cubic contents, but on the other hand, deductions are made for only a part of the window and door openings. In other words, we add 3 brick for every cubic foot of wall and it is this additional ⅛ which makes the profit for the contractor. But when we estimate concrete work we take the actual cubic contents with the uniform price per cubic yard.

## A Revelation in the Production of Concrete Building Stone

Realizing the growing demand for a practical mould for producing poured concrete stone, in lieu of the cumbersome cast iron and boiler plate moulds on the market, we have designed what we style our Flexo Moulds, made throughout of Galvanized Sheet Steel. They will not rust, not corrode, nor stick to the wet mortar, but produce a stone with faces as smooth as pressed brick, writes the Flexo-Concrete Mould Company.

Flexo Moulds are made in two styles, a fifteen-unit wall type, as illustrated on this page, and the four unit corner type. The fifteen-unit mould is composed of but five distinct parts, viz.: two side rails, fourteen intermediate cores, two end or half cores, fifteen palletts

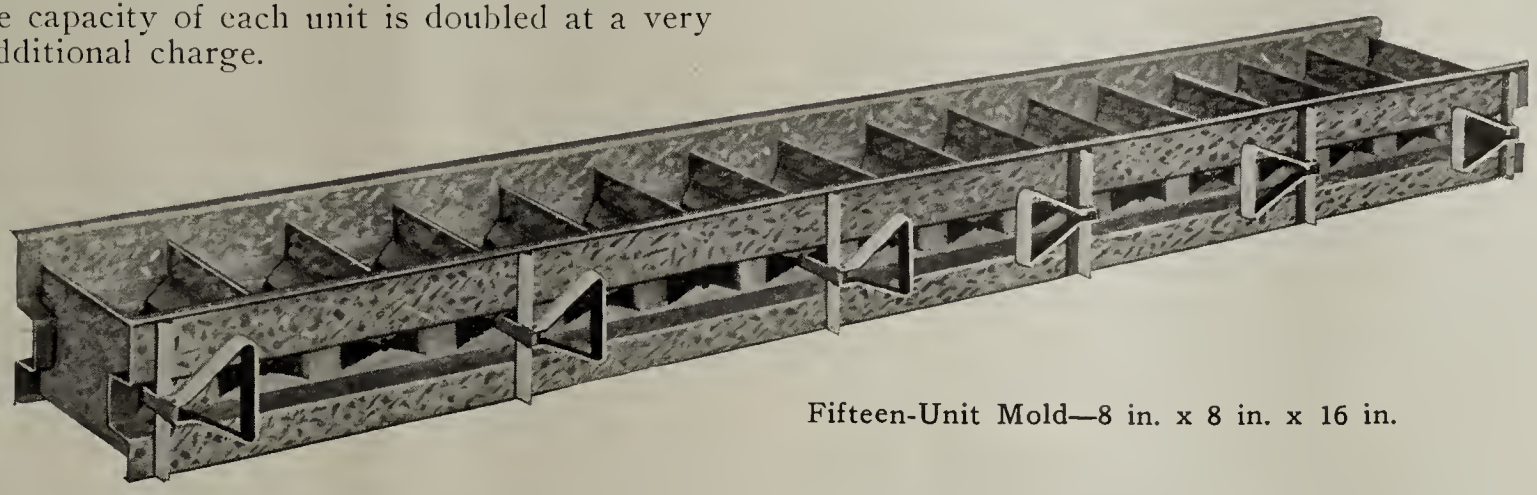


and six clamps. These parts being interchangeable, the entire mould can be assembled and secured with the clamps in three minutes. The entire fifteen-unit moulds weigh but a trifle over one hundred pounds. but one sack of Portland Cement, two parts sand and four parts aggregate poured in this mould produces fifteen 8x8x16 Concrete Building Stone, with a minimum of labor.

With this equipment is included a very novel yet practical process of making faced stones. By the use

of a spreader riding on the top of the side rails to evenly distribute any facing desired and a large roller following the spreader troweling the facing into the wet mortar, producing a beautiful face with all the lights and shadows and the permanency of natural stone.

Flexo Moulds are so constructed that the clamps and side rails may be removed after the stone has stood a few hours and with an extra set of cores and palletts the capacity of each unit is doubled at a very nominal additional charge.



**Fifteen-Unit Mold—8 in. x 8 in. x 16 in.**

The entire equipment is priced at a very nominal figure and it will pay interested parties to communicate with us. We will ship to responsible concerns on thirty days' trial. Write the Flexo Concrete Mould Company, c/o Cement and Engineering News, 672 Transportation Building, Chicago.

## Serviceable Sand and Gravel Loader

The very serviceable gravel digger and loader illustrated on this page is proving its worth at several sand and gravel pits where no two sets of conditions are alike. This machine is also a speedy digger and makes an appreciable excavating record for quantity handled and at low cost, but it is especially noteworthy because of its portability. This feature is becoming more and more important.

The machine can be obtained with walking traction if desired. It is built of steel and is easily dismantled and moved; has a long rotating arm, flexible control and ample power. Its makers claim that its operating and up-keep costs are surprisingly low. Prices and catalogs concerning this machine will be mailed to interested parties by Cement & Engineering News, 672 Transportation Bldg., Chicago.

**Gravel Loading Machine**

## Important New Motor Books

Laird & Lee, Inc., Chicago, announce that they have now in press the 1918-1919 edition of "The Modern Motor Car," by Harold P. Manly. It will be issued in one compact volume of 536 pages, large 12mo, with 225 illustrations from detail drawings and photographs and a 24-page alphabetical index, durably bound in flexible keratol, with round corners and colored edges. The revisions and additions bring this standard work up to the very minute, making it a complete, practical and handy reference cyclopedia on all matters connected with the care, repair and upkeep of every type of automobile, old and new.

The same firm have also in hand for immediate publication: "The Farm Tractor—Its Care and Repair," by Wallace B. Blood. This will be uniform in style and size with "The Modern Motor Car," and at the same price, $2.00, postpaid.

## Austin Cube Mixer

A conspicuous feature of the concrete mixer manufactured by the F. C. Austin Co., Chicago, Ill., and recently described in a new catalog, No. 21, is the cubical form of the mixer body. It is claimed that mixers of other shapes, provided with interior plows and paddles, mix by separating and re-distributing the batch, and it requires many of these fraction-of-a-batch motions to produce a full-batch motion. It is claimed also that the mixing action is entirely different and that the devices used in other mixers are not needed in the cube.

The Austin cube mixer is all steel construction and consists of a cube journaled at diagonally opposite corners and mounted on a tilting frame which is in turn mounted on a stationary frame, on skids, or a portable truck. The tilting frame can be arranged for front, rear-end, or side-discharge, as ordered. Portable mixers have the engine mounted on the truck with the mixer; stationary mixers may have the engine mounted on skids or may be belt driven. All Austin cube mixers receive their charges and discharge their batches without stopping rotation.

An automatic measuring tank accurately measures the water in every batch. The water supply can be varied by raising or lowering the gage rod projecting through the top of the tank.

# The New Modern Rock Crushing Plant of the Brownell Improvement Company

### One of the Largest and Most Complete of Its Kind That Has Been Erected

The new rock crushing plant of the Brownell Improvement Co., recently built at Thornton, Ill., is generally considered to be the largest in the world. It has not as yet been worked to its full capacity. Although designed for an output of 7,000 yards a day, there is every indication that this amount could be exceeded by 25 per cent, or 8,750 yards, amounting to over 200 carloads.

In the quarry and crusher, 225 men are employed on the average, for a 10-hour day. They are mostly in the quarry. In the crusher itself, this enormous tonnage goes through like clock work, automatically almost, with little more attention than is required in a country grist mill.

### Quarry Operations

There are approximately 100 acres in the present workings, although the Brownell Improvement Company owns a tract at this point of some 600 acres. The rock is limestone, characteristic of the Lake Michigan region. There is about 6 feet of overburden which is removed by steam shovel.

The rock is first thoroughly loosened by blasting over large areas. Holes 6 inches in diameter are drilled from top to bottom of the bench. Ten well-drilling equipments are employed a large part of the time on this work. They are of the Cyclone type, built by the Sanderson Cyclone Drill Co., Orrville, Ohio. They are motor driven, current being secured by tapping off from a transmission line which extends around the quarry. The holes are 50 feet deep on the average, spaced about 18 feet apart each way, the first row being about 28 feet back from the face. One hundred seventy-five to 200 pounds of bulk dynamite is used in each hole, 40 to 60 per cent, depending upon the rock. On the average 150 to 200 holes are shot at once—electrically, direct from the 440-volt transmission line. In drilling the holes, they are lined with second-hand iron pipe as deep down as loose material prevails.

The rock is thus loosened thoroughly for a distance of 50 feet or more back from a face several hundred feet long. Practically all of the material is small enough to be handled by the six steam shovels which are kept working continuously.

The water supply to the shovels is brought from the central pumping station through an elaborate system of piping extending to all parts of the quarry—starting out with 5-inch pipe and decreasing to 1½-inch at the shovels.

Most of the rock at the face is small enough for the shovels to negotiate. Some chunks, however, are found too large to be picked up or broken by the impact of the bucket. These are drilled and blasted with a ½ to 1½-pound stick of dynamite. Each shovel carries two Ingersoll-Rand jackhammer drills for this work, on the end of about 50 feet of armored hose. The Westinghouse compressor for these drills is carried on the shovel.

Standard gauge railways serve the shovels. Six 30-ton steam locomotives are in operation. These draw coal out to the shovels and rock back to the incline, in 8-yard dump cars. There are about 130 of these cars in operation. They are made by the Brownell Company, during the winter months.

The New Rock Crushing Plant of the Brownell Improvement Company.

The bottom frame work of the cars is made of old rails, the side frames of angle iron. These are cut into the proper lengths by means of Imperial Brass Manufacturing Company oxy-acetylene cutting torches, of which the company has two. In fact a great many uses are found for the torches around the quarry. In renewing bucket teeth, thousands of rivet heads are cut off in this manner in a season. Boiler plate is cut up into all sorts of shapes and sizes to make repair parts for cars, shovels, etc. The old pipe used for blast hole linings is also cut up into suitable lengths in the same way.

### Crushing Plant

The rock is first broken by the No. 24 Allis-Chalmers gyratory crusher to 6-inch size. It is then hoisted by a 72-inch pan conveyor to the top of an 80-foot tower, where it discharges over an 8 by 28-foot grizzly, flat-bar screen with 2½-inch openings between bars.

The oversize goes into a bin of about 500 yards' capacity which feeds four No. 7½ Gates crushers which break it to 3½-inch size. This product then goes to two No. 9 elevators of about 90-foot centers which raise it to four scalping screens 60 inches in diameter by 16 feet long. These screens have 2¾-inch perforations.

The undersize from the scalping screens is carried by two 36-inch belt conveyors to four 60-inch by 24-foot final sizing screens setting over the bins.

The oversize from the scalping screens falls to a bin of about 300 yards' capacity, feeding ten No. 6 Gates crushers set to make 2-inch product.

This product is then carried by two 30-inch conveyors discharging onto two 36-inch conveyors, which in turn discharge onto two No. 9 elevators which discharge into four 60-inch by 24-foot final sizing screens setting over the bins and adjacent to similar screens mentioned above.

Going back to the fine material from the grizzly, this falls into a bin of 250 yards' capacity from which it is carried by a 36-inch belt conveyor to the north side of the plant, where it discharges into a 36-inch incline belt conveyor that discharges into two 60-inch by 24-foot revolving screens for final sizing, located over the bins adjacent to similar screens mentioned above.

It is noted that there are installed ten 60-foot by 20-foot final sizing screens all on one floor over the bins.

On the floor immediately below these are ten double, 7 by 14-foot shaking screens which separate all material into three grades: 1¼-inch stone, ½-inch stone and screenings.

Rejections from the above bank of revolving screens are carried by two 24-inch belt conveyors located on the shaker screen floor to the center of the building, where they are discharged to a 30-inch belt conveyor which carries the stone to a bin of about 500 yards' capacity located in the recrusher house east of the No. 6 crushers.

About this bin are grouped ten No. 4 crushers set to make 1-inch product. These discharge into two 24-inch conveyors which in turn discharge into the 36-inch conveyors that handle the stone from the No. 6 crushers and feed to the two No. 9 elevators leading to the sizing screens.

Under the screen house are the loading bins with a total capacity of 4,000 yards divided into 30 compartments. Under them run three lines of standard gauge tracks which are combined in the yard into one track running over the railroad scales. From this point, the tracks spread out into numerous branches for sorting out trains for shipment.

The crushers, motors, turbines, pan conveyors, elevators, screens and hoists are of Allis-Chalmers make.

### Power Plant and Electrical Features

The plant is electrically operated throughout by 60-cycle, 3-phase, 440-volt, alternating current. This is generated by an Allis-Chalmers steam turbine supplied with steam by three 400-horsepower Ladd high-pressure (175 pounds) water tube boilers.

The boiler plant is in a building separate from the turbine house. The boilers are served by a 7 by 175-foot concrete stack.

The steam turbine is of 1,500-horsepower capacity, direct connected to a 1,000 kilowatt alternating current generator—480-volt, 3-phase, 60-cycle. This unit operates at a speed of 3,600 revolutions per minute.

There are 43 motor installations at the plant, of a combined capacity of 2,453 horsepower. The power consumed amounts to 8,500 kilowatt hours per day on the average, based on 10-hour service.

Water for the boilers and general supply is obtained from a basin about 600 by 800 feet which about 25 years ago was excavated to a depth of 40 feet below the present workings. This basin is kept nearly filled with water by springs in the vicinity. Two Allis-Chalmers centrifugal pumps of 2,400-gallon and 2,300-gallon capacity, respectively, are stationed at the brink of this basin, to pump the water to the condensers in the power station, to the boiler room and other points. Each is driven by a 75-horsepower motor.

Naturally, the water coming from the limestone beds is very hard and it is treated for all purposes by a water softener system.

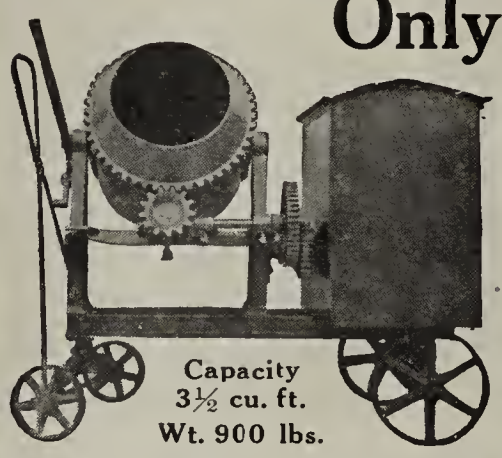
### Local Business

While by far the larger portion of the material produced at this plant is shipped, Chicago being the principal market, the company does a local business of considerable magnitude. This is in the way of furnishing materials for cement road building in the locality, and for contractors' use.

In this end of the business they employ three United motor trucks made by the United Motors Company, Grand Rapids, Mich. These are loaded direct from cars by means of two locomotive cranes, made by the Link-Belt Company of Chicago.

The arrangement of the plant from the farthest point in the quarry straight through to the loading point has been planned with extreme care, to provide for a continuous, adequate flow of material with the greatest economy of power and labor. The railroad switching facilities are sufficient and well planned. The company owns its own switching and loading tracks which are located on its ground adjacent to the present workings. When it becomes necessary to extend the latter, the present tracks may be moved farther along on the 600-acre tract. In the quarry and switch yards there is a total of eight miles of railroad track.


Only $160.00



for this complete, all-steel power mixer, including trucks, engine and housing.

A great mixer for any class of work and good for jobs of all sizes.

Capacity 3½ cu. ft. Wt. 900 lbs.

Hand or Belt Mixer $55.00

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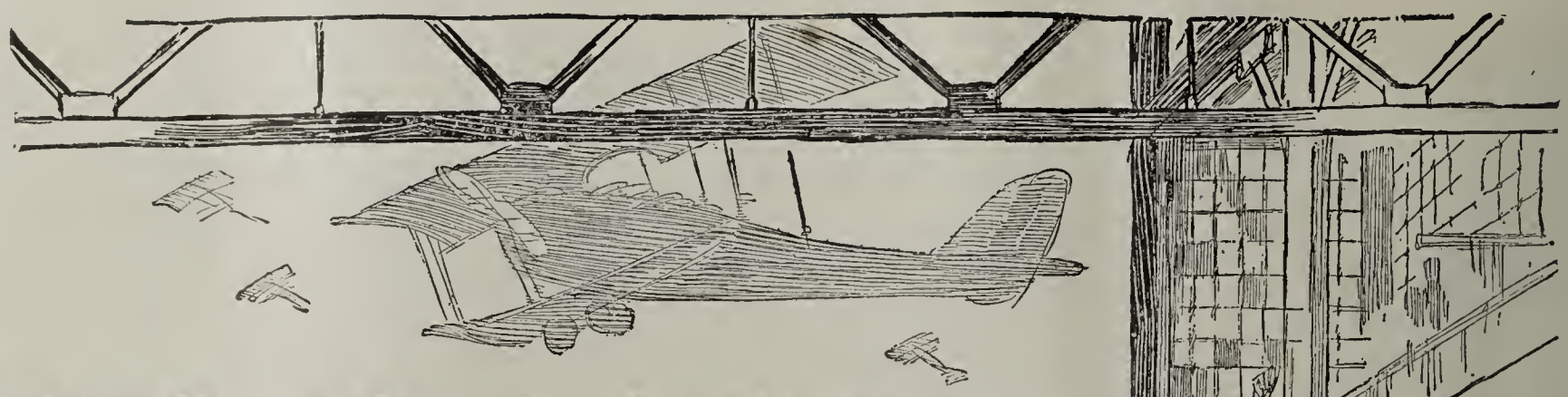


# The Right Men in the Right Jobs Will Win The War

THE true American wants to work where he will help win the war. He wants to fit in. America needs the Right Men in the Right Jobs. Only when this comes about can maximum production be obtained to support our armies at the front.

The needs of all war industries can be anticipated and met by the Government if employers and laborers will avail themselves solely of the nation-wide machinery which is at hand. The length of the War depends directly on our Country's ability to supply all War Industry with the best workers the country can produce the moment they are needed.

The U. S. Employment Service is the official bureau of the Federal Government in charge of the distribution of labor. The President has declared that it is the official agency for recruiting and distributing unskilled labor for war work..

**PRESIDENT'S STATEMENT**

"Industry plays as essential and honorable a role in this great struggle as do our military armaments. We all recognize the truth of this, but we must also see its necessary implications—namely, that industry, doing a vital task for the Nation, must receive the support and assistance of the Nation."

• • •

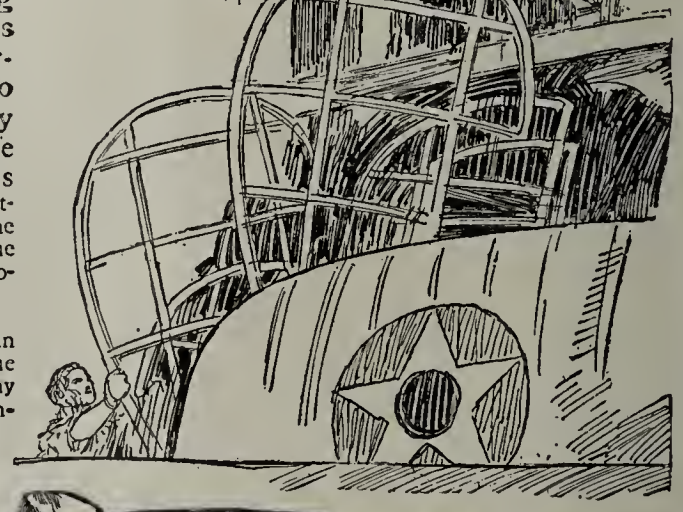
"Therefore, I solemnly urge all employers engaged in war work to refrain after August 1st, 1918, from recruiting unskilled labor in any manner except through this central agency [the U. S. Employment Service]. I urge labor to respond as loyally as heretofore to any calls issued by this agency for voluntary enlistment in essential industry. And I ask them both alike to remember that no sacrifice will have been in vain, if we are able to prove beyond all question that the highest and best form of efficiency is the spontaneous co-operation of a free people."

WOODROW WILSON.

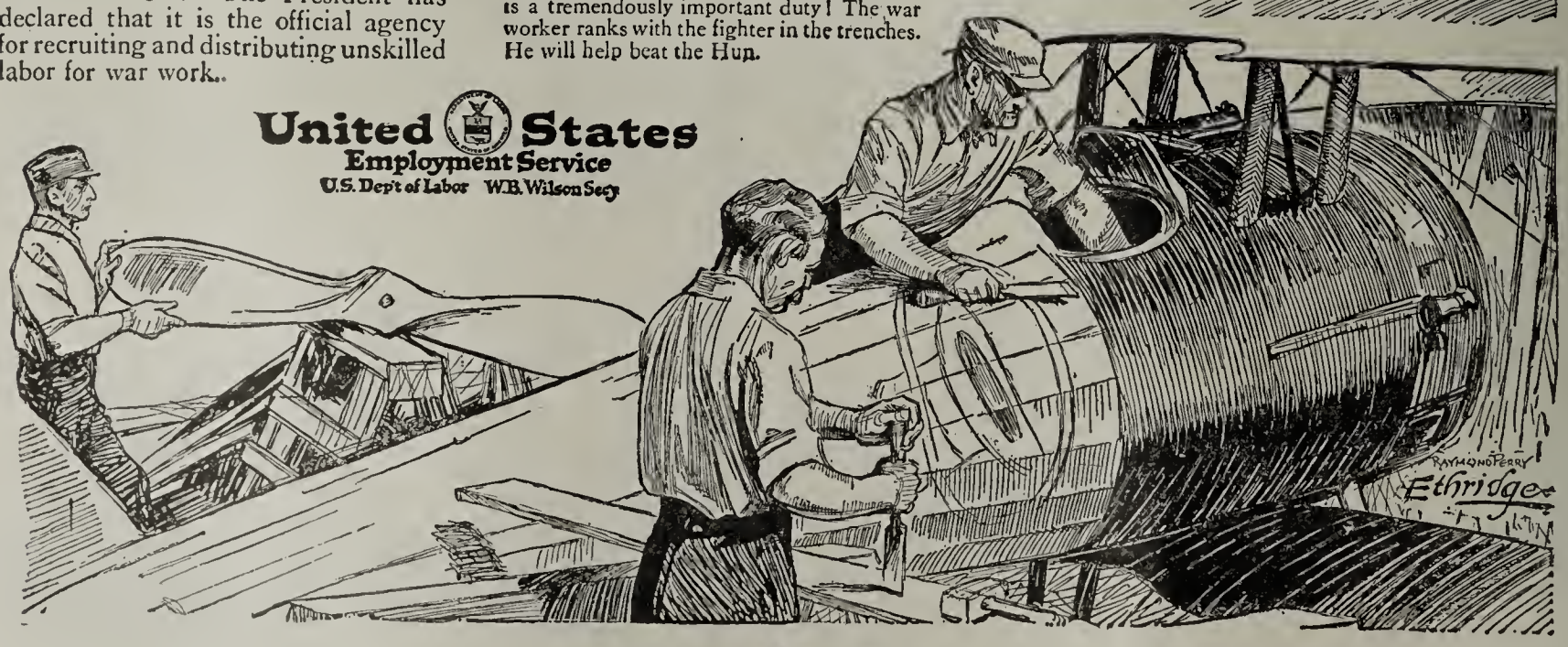
It has over 500 branches throughout the nation, and 20,000 U. S. Public Service Reserve enrollment agents. Ask the local post office or newspaper for name and address of the nearest representative, or write to the U. S. Employment Service, Washington, D. C.

Those employers in war work who seek to get labor through their own or private recruiting agencies are interfering with the Government's machinery and preferring their interests to those of the nation. Only through strict compliance with the Government's program can the constant, restless shifting of labor from one war job to another, with the consequent diminution in production and efficiency, be prevented.

Above all, the Government urges every man engaged in war work to stick to his job until the Government recommends that he change. Any man not engaged in war work should put himself at the disposal of the nation by registering with the Public Service Reserve. This is a tremendously important duty! The war worker ranks with the fighter in the trenches. He will help beat the Hun.



**United States Employment Service**
U.S. Dep't of Labor W.B. Wilson Secy

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**Northwestern Steel Forms**

**Write for Bulletin 29**

For concrete tile, culverts, flumes, sewers, etc. Used and recommended by leading engineers and highway commissioners for all hard-to-do jobs. There is a Northwestern Steel Form designed for every purpose and to meet every problem. It costs nothing to find out what they can do and save you in your work.

Northwestern Steel & Iron Works
(Capital $200,000)
Eau Claire, Wisconsin.

***Moderate in Price and with a Reputation for doing more than is claimed for them***

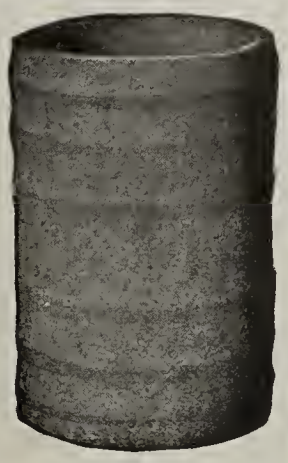
Jaeger Mixers **make** good because they are **made** good. No useless parts—no skimping. They are big enough for the big jobs and not **too** big to handle the little ones with profit.

And there's a Jaeger Mixer that just fits **your** needs. Let us tell you about it.

**The Jaeger Machine Company**

**212 Rich St.**
**Columbus, Ohio**

**The Biggest Tile Business on Record**



Get action now. Big spring buying of drain tile will start soon—and it will be the biggest on record. Cement tile is needed wherever farming is done. Thousands more tile plants are needed to fill the demand.

Equipment must be selected and installed, manufacturing perfected, and a stock of tile made up—all within the next few weeks. Enlist our co-operation.

Dunn equipment is standard. It represents the minimum necessary investment, is sold on a strict guarantee to satisfy, and on 15 days' trial. Ask for the book, "Cement Drain Tile"; we send it free.

**W. E. DUNN MFG. CO.**

414 24th Street HOLLAND, MICH.

**BALLS**

Forged steel balls of special analysis steel from 2" to 15" in diam. carried in stock. Can't be excelled.

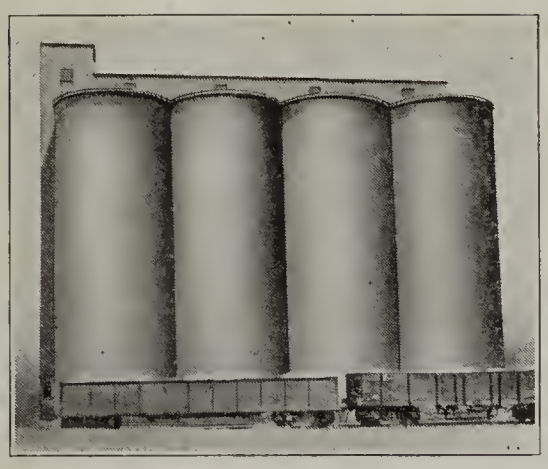
BALL MILL PLATES
CRUSHER SHAFTS
GRIFFIN MILL SHAFTS
GRIFFIN MILL CONVEX SEATS
GRIFFIN MILL CROSSHEADS
PIPE FLANGES for High Pressure Work
STEAM SHOVEL, TRUCK AND CAR AXLES

**Hammer and Hydraulic Press Forgings of all kinds**

*We make quick service a feature of our business*

**TIOGA STEEL & IRON CO.**

52nd AND GRAY'S AVENUE, PHILADELPHIA, PA.



**Eleven Bin Stock House**

Erected for the

**Ft. Dodge Portland Cement Co.**

GILMORE CITY, IOWA

BUY MORE
**LIBERTY BONDS**

Let HOAG Build your Stock House

**D. F. HOAG & CO.**

**Engineers and Builders**

Corn Exchange - - MINNEAPOLIS

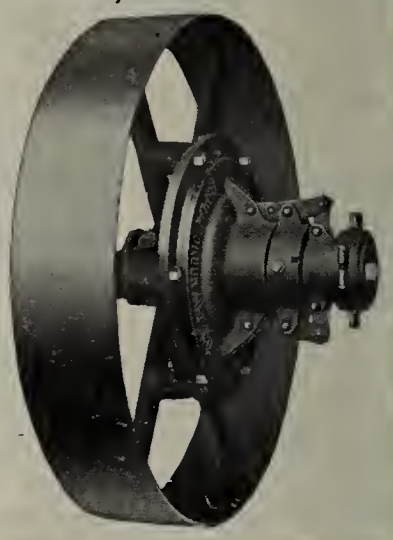
# LITTLE DAILY LEAKS OF POWER BOOSTS YOUR COAL BILL

The High Cost of Power Is Reduced to a Minimum By the Use of a

## Plamondon Disc Type Friction Clutch

The power of this clutch is unusual. The double toggles on this clutch develop such tremendous pressure that even on the largest clutches only a hand lever is needed to engage or disengage the clutch. The geared devices usually needed to operate large clutches are unnecessary.

This is only one of the practical advantages the cement mills find in this clutch. Write for our new catalog No. 59 and learn the rest of them.



WE ALSO MANUFACTURE GEARS

**A. Plamondon Mfg. Co.**

12-24 N. Clinton St. CHICAGO, ILL.

Cut Gears

Spur,
Spiral,
Bevel and Worm
Steel and Rawhide

*Accuracy and Prompt Delivery*

When you want a gear cut you want it **quickly,**—we emphasize our promptness without sacrificing accuracy.

## Ganschow Cut Gears

stand first in accuracy—perfect mesh—silent operation and the quality that counts for long service.

*Estimates furnished from drawings and specifications.*
*WRITE FOR CATALOG.*

**WILLIAM GANSCHOW CO.**

1003 W. Washington St. - CHICAGO

# Everything in CUT GEARS

We have the largest and most modern equipped gear making plant in the west. Our gear making machinery embraces everything known that will in any way facilitate the manufacture of high-grade cut gears of all kinds up to 15 feet in diameter.

**Quick Deliveries, Low Prices and First Class Work Our Motto**

## Foote Bros. Gear & M. Co.

**210 to 220 N. Carpenter St., Chicago**

The KENT

A Specially Designed

**Mixer for Products Plants**

Seventy per cent of the bigger block, tile, brick and specialty concrete products plants of the country use the famous Kent Mixer.

Equipped with automatic feeding device, it makes certain a proper proportioning of aggregates and being continuous in operation, it saves time and labor. The biggest concrete products plant in the world has found that four Kent machines will mix fast enough to keep its many tampers and mold machines busy.

**Write today for descriptive literature and prices.**

**THE KENT MACHINE CO.**
Kent, Ohio

IMMEDIATE DELIVERY
"Franklin"

ROUND—SQUARE—FLAT—SQUARE TWISTED

**STEEL BARS**
for CONCRETE REINFORCEING

We can meet your Reinforcing Steel Requirements. This means not only quick shipment from the mills but co-operative service for rapid transportation. If you want to know just what your exact cost will be, send us the Blue Prints and we will give you a lump sum bid on all the steel sheared to lengths, bent to specifications and delivered to the job,

*Our Engineering Department is at your service.*

**The FRANKLIN STEEL WORKS**
FRANKLIN, PENNA.

Cleveland, 1320 Rockefeller Bldg.
Boston, - - 12 Pearl Street
Philadelphia. 2215 Race Street
New York, - 30 Church Street
Chicago, - - 332 So. Michigan Blvd.
Buffallo, - Erie County Bank Bldg.
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QUALITY SERVICE

**Inland Deformed Bars**

In Open Hearth Steel (New Billet Stock), Hard Grade, and Rail Carbon Steel (Rerolled).

The mechanical bond is theoretically correct and is guaranteed by us, having been designed by expert concrete engineers and approved generally by engineers and architects.

The corners are rounded to prevent splitting of the concrete. Bending, fabricating and setting are easily done with these bars. Sizes ⅜ to 1¼ inch. Lengths up to 85 feet.

Prompt shipments during 1918.

**INLAND STEEL COMPANY First National Bank Bldg., CHICAGO**

BECAUSE WE SPECIALIZE ON
**Lock Seam Pipe** with the smooth inside surface, having already furnished large quantities for Potash Recovery plants, we are able to give especially careful attention to the construction of this class of Pipe.

**Robertson Bros. Mfg. Co., Chicago**

**Luten, Roberts & Titus**
INDIANAPOLIS
*Designing and Consulting Engineer*
*Reinforced Concrete Bridges Exclusively*
Associate Engineers in each State

**BELTING**
"V-B" Balata
"AMPERE"
(Canvas Stitched)
"WHITE SEAL"

Write for Prices, Discounts and Samples
VICTOR BALATA & TEXTILE BELTING CO.
Factory: Easton, Pa. Main Office: 38 Murray St., New York
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CONVEYOR BELTS A SPECIALTY

# Attaining The Maximum In Output and Economy

## Finally Narrows Down To The Adoption of-

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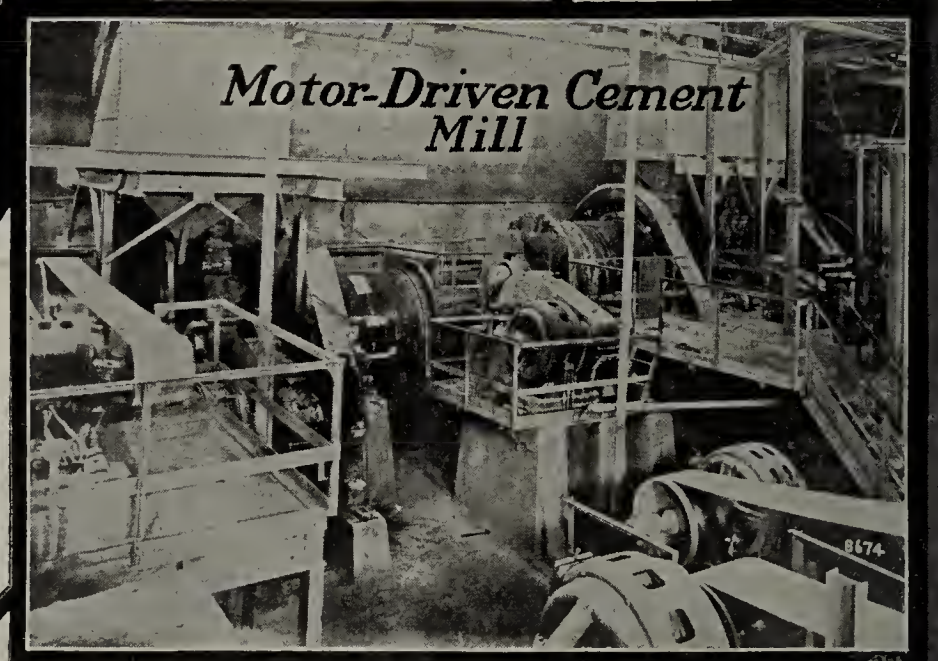
WESTINGHOUSE ELECTRIC

*Westinghouse Motors and Control*

*Increase production, are economical in the use of power, and lower maintenance costs.*




The war is showing us the faults of the past, and is leading us to newer methods and higher efficiencies.

The Cement plant is no exception. Greater speed and efficiency is needed. Many have already taken the forward step and are reaping the benefits of Westinghouse Electric Drive.

You will not attain your maximum until you adopt Electric Drive.

**Westinghouse Electric & Mfg. Co.**

**East Pittsburgh, Pa.**

# Westinghouse —Electric Drive

# STEEL BARS FOR Reinforcing Concrete

OUR SERVICE
ESTIMATING
SETTING AND BENDING DETAILS
BENDING

PLAIN AND DEFORMED ROUNDS AND SQUARES

Shipments from Stock and Mill Rolling

## CALUMET STEEL COMPANY

CONTINENTAL AND COMMERCIAL BANK BUILDING
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## THE FULLER ENGINEERING COMPANY

**Designing, Constructing and Operating Engineers**
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**Reports, Examinations and Analyses of Raw Materials for Cement Consultations Solicited**

**Offices: Allentown National Bank Bldg.**
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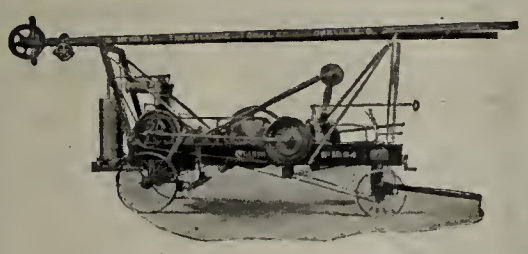
WE-FU-GO AND SCAIFE
PURIFICATION SYSTEMS
SOFTENING & FILTRATION
FOR BOILER FEED AND
ALL INDUSTRIAL USES

WM. B. SCAIFE & SONS CO. PITTSBURGH, PA.

## A Big Blast-Hole Drill That's Reliable



### The Cyclone No. 14

Heavy, solidly braced frame — Sill timbers 4" x 14". All machinery placed directly on the main sills protecting it against strains and preventing top heaviness. **Eighty per cent (80%) of the castings are cast steel**—not cast iron. The Cyclone No. 14 is the only Blast-Hole drill so built. Furnished in Steam, Gasoline, Compressed Air or Electric Power; traction or non-traction.

**The Sanderson Cyclone Drill Co., Orrville, Ohio**
**Eastern and Export Office, 50 Church St., New York, N. Y.**

# PULVERIZED COAL EQUIPMENT

AERO PULVERIZER CO., 120 BROADWAY, N.Y.

## WOULD YOU USE AN INTERMEDIATE SYSTEM FOR CONVEYING YOUR FINISHED GRAVEL FROM PLANT TO CAR IF YOU COULD SPOT THE CAR UNDER THE SPOUTS OF THE BIN?

Not If You Could Help It Would You?

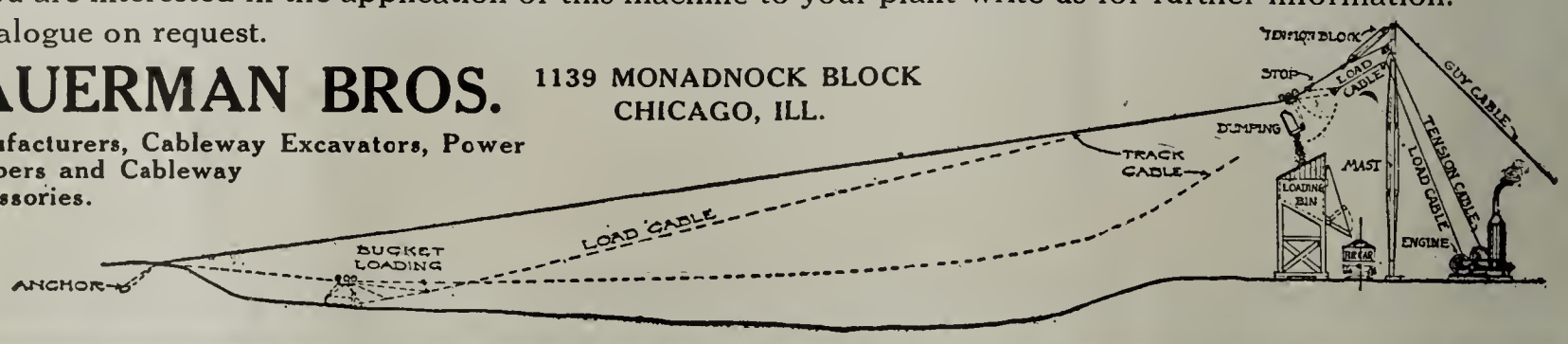
Then is it not just as logical to do away with an intermediate conveying system between **pit** and plant?

Are you using one machine for digging the material and another to convey it to the plant when you could just as well use one machine for the combined operation, saving the additional labor, machinery and upkeep cost?

The Sauerman Dragline Cableway Excavator is digger, conveyor and elevator combined in one.
It is the direct method from pit to plant.
It digs, conveys, elevates and dumps in one continuous forward operation.
Operated by a double drum friction hoist under one man control.
One Machine—One Operation—One Man Control
If you are interested in the application of this machine to your plant write us for further information.
Catalogue on request.

**SAUERMAN BROS.** 1139 MONADNOCK BLOCK CHICAGO, ILL.

**Manufacturers, Cableway Excavators, Power Scrapers and Cableway Accessories.**



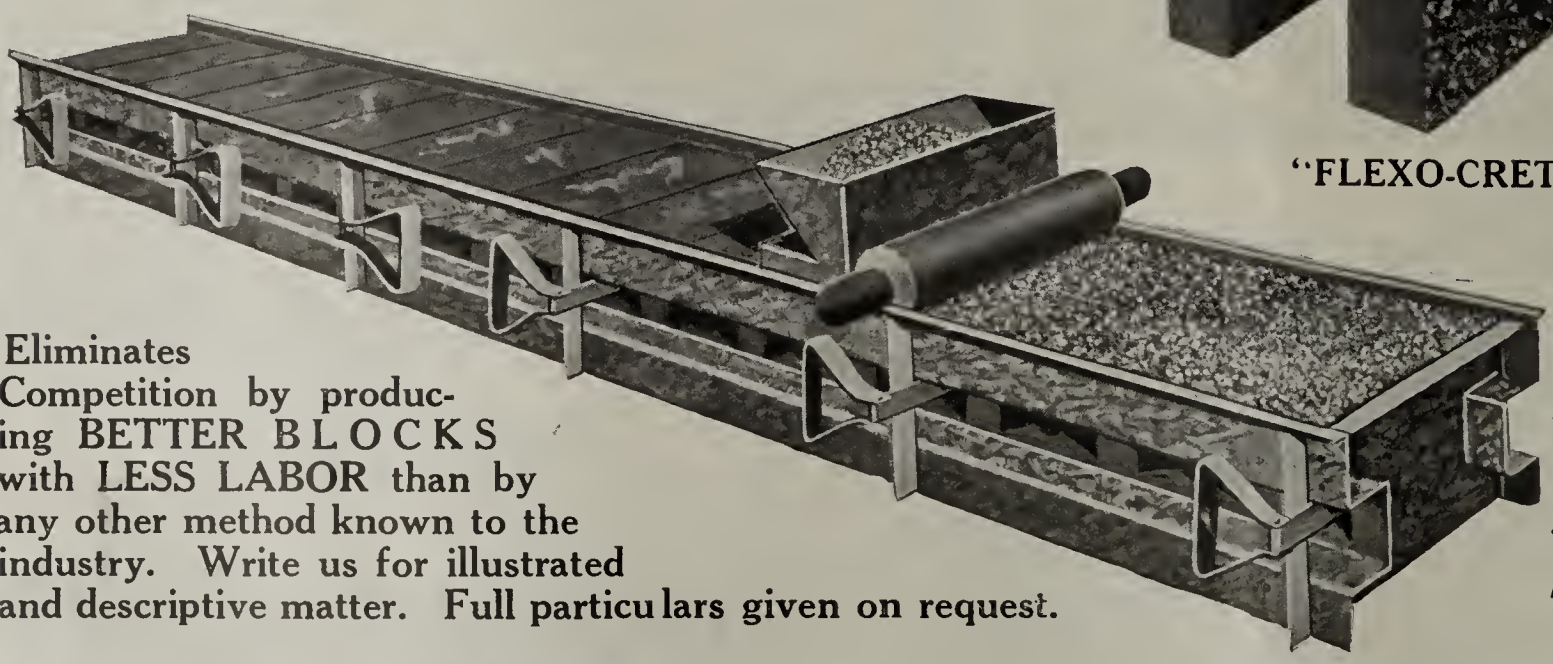

# Flexo-Galvanized Steel Moulds

For Producing

# Poured Concrete Building Stone

Greatest Labor Saving Device of the Times.
A God send to the Building Block Industry.

"FLEXO-CRETE"



Eliminates Competition by producing BETTER BLOCKS with LESS LABOR than by any other method known to the industry. Write us for illustrated and descriptive matter. Full particulars given on request.

*We ship on thirty days trial to responsible parties.*

**Flexo-Concrete Mould Company.** **Cedar Rapids, Iowa**

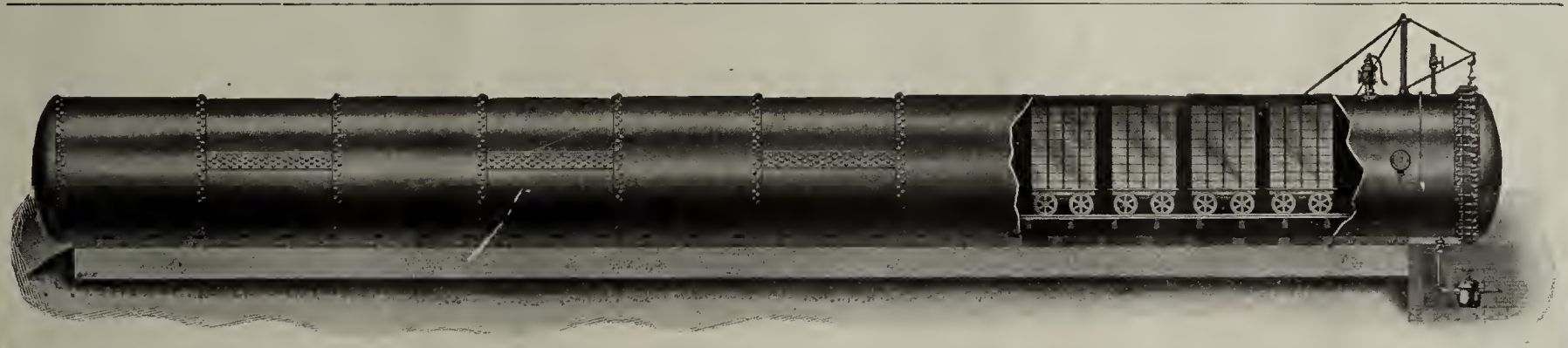
# Sand Lime Brick Machinery

Our complete line of Sand Lime Brick Machinery makes it possible to secure just that machinery which is required to make your plant a success. We favor no particular type of machinery but are guided by the needs of the customer. Our wet and dry grinding mills have transformed a number of unsuccessful plants into dividend producers, while our Presses, Mixers, Hardening Cylinders and other equipment are of equal quality. We can exactly meet the demands of any manufacturer with a quality of machinery which will operate at a profit with a minimum amount of attention and expense.

*Correspondence solicited*

## The American Clay Machinery Co.

**WILLOUGHBY, OHIO**



## EXCEPTIONAL OPPORTUNITY

# Complete Cement Plant

## Capacity 750,000 Bbls. Annually

**LOCATION, BEDFORD, IND.**

We own and offer for sale the above plant and offer it either as a whole or in part. Quotations will be made on any parts desired. Buildings:

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| Raw Material Building | 130x135 ft. |
| Raw Material Annex Building | 43x 90 ft. |
| Rotary Kiln Building | 95x180 ft. |
| Coal Drying and Grinding Bldg. | 58x 80 ft. |
| Dry Grinding Building | 90x114 ft. 5 in. |
| Storage Warehouse | 80x250 ft. |
| Boiler and Power House | 91x100 ft. |
| Repair Shop | 30x119 ft. |
| Coal Storage Building | 25x100 ft. |

All buildings structural steel with brick walls.

2—300 H.P. Cahall Vertical Water Tube Boilers.
4—250 H.P. Geary Water Tube Boilers.
1—375 H.P. Heine Boiler.
All 160-lb. pressure.
1—1000 K.W. Vertical General Electric-Curtis Turbo-Generating Set.
1—800 K.W. Vertical General Electric-Curtis Turbo-Generating Set.
Both sets 3 phase, 25 cycle, 480 volts; one complete switchboard panel for the above, also condenser for the turbines, circulating pumps—everything complete and now in position.

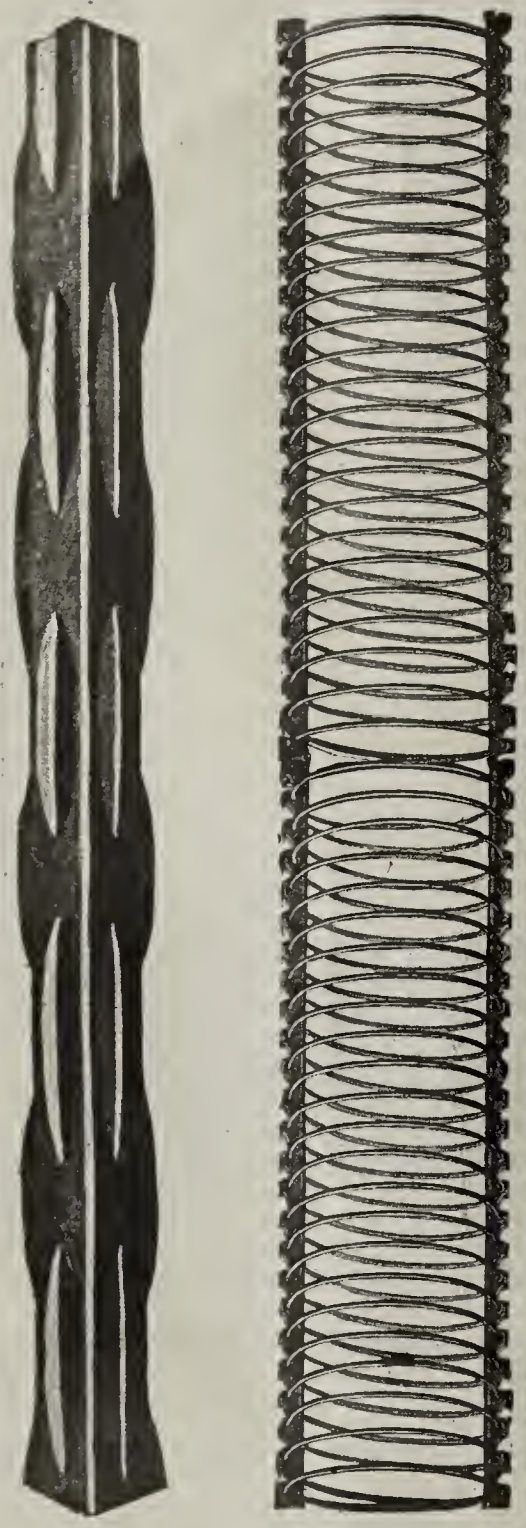
20—10-ton steel hopper dump cars.
2—Austin No. 6 Gyratory Late Type Crushers, with elevators, screen, etc.
1—60 in. x 50 ft. Moser Dryer.
2—60 in. x 40 ft. Sinker Davis Dryers.
1—Allis-Chalmers set of Anaconda Rolls, sizes 40x15 in.
3—5x22 ft. Gates Tube Mills.
32—30-in. Griffin Pulverizing Mills.
10—Allis-Chalmers Rotary Kilns, 7 ft. to 5 ft. 6 in. x 60 ft., complete with Automatic Kiln Feeder Boilers, coal pulverizing equipment, etc.

Besides the above, the plant is equipped with all the necessary conveyors for material, elevators, all copper wire for transmitting current, laboratory complete, office buildings, stone quarry, shale quarry, sidings, workmen buildings and approximately 325 acres of Real Estate.

*For Prices and Full Particulars Address*

## McCOY-BRANDT MACHINERY COMPANY

**216-218 Penn Avenue, Pittsburgh, Pa.**



# STEEL BARS

AND

# SPIRALS

FOR

REINFORCED CONCRETE CONSTRUCTION

# "Bars on the Job Ready for Your Men"

Delay, caused by the failure to have your reinforcing material on the job not only throws out your calculations but also the schedule of every other contractor on the job.

You can save the loss of much time and money by specifying Havemeyer Bars for your reinforced concrete work.

Their prompt service insures your having bars on the ground when the men go to work.

# HAVEMEYER BAR

Service insures direct shipments of reinforcing steel from our Chicago warehouse, which is located within easy teaming distance of the loop and makes delivery when material is needed.

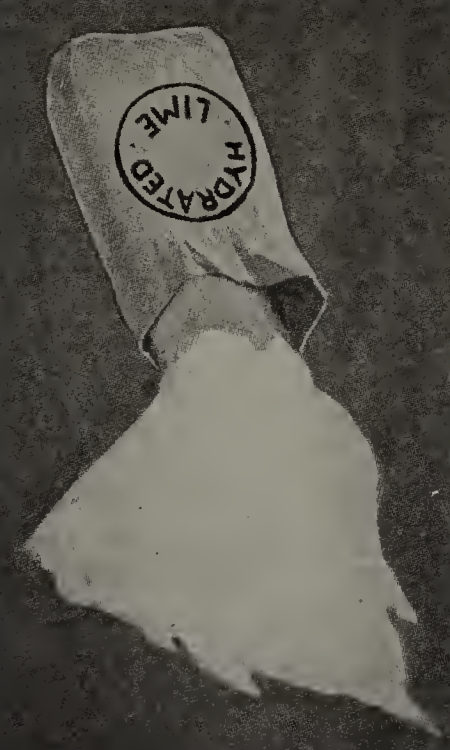
Havemeyer Products, Bar-Tys, Bar-Spacers, Ty-Chairs, Beam-Saddles, Etc., keep the steel in its right place while the concrete is being poured.

*Try Our Service*

## CONCRETE STEEL CO.

MONADNOCK BLDG. CHICACO

# The story of HYDRATED LIME




## SHOOTING CONCRETE 4,000 FEET

Out at San Francisco the Twin Peaks Tunnel is being built by R. C. Storrie & Co. It passes through water bearing soil and City Engineer M. M. O'Shaughnessy specified Hydrated Lime in the concrete to make the structure waterproof, eight pounds of hydrate being used to one hundred pounds of cement; the concrete proportions being 1 cement, 2¼ sand and 5 crushed gravel, graded from ¼ to 1¼ inches.

R. C. Hackley, engineer for the contractor, writes:

"On this work the pneumatic concrete placing system is used and we have shot the concrete twenty-six hundred feet through eight-inch pipe and expect to extend this line to four thousand feet or more; the lime being a great help as a lubricant. Where chutes are used they can be much flatter and will carry the concrete much farther with lime in the mix; in fact we have used lime for this purpose and for easier placing in narrow walls and around reinforcement, even when not specified, on account of the labor saved.

"The uniformity of the concrete on this piece of work and the absence of honeycomb patches can be greatly attributed to the use of Hydrated Lime."

*Write any of the following competing manufacturers of Hydrated Lime for complete information about Hydrated Lime in Concrete.*

**Marblehead Lime Co.,**
Chicago—Kansas City

**Port Byron Lime Assn.,**
Port Byron, Ill.

**Tidewater Portland Cement Co.,**
Baltimore, Md.

**Lee Lime Co.,**
Lee, Mass.

**Glencoe Lime & Cement Co.**
St. Louis, Mo.

**Ste Genevieve Lime Co.**
St. Louis, Mo.

**Dutchess County Lime Co.,**
Dover Plains, N. Y.

**Palmer Lime & Cement Co.,**
103 Park Ave., New York, N. Y.

**Rockland & Rockport Lime Co.,**
New York—Rockland, Maine—Boston

**The A. & C. Lime Co.,**
Canton, Ohio.

**Kelley Island Lime & Transport Co.,** Cleveland, Ohio.

**National Lime & Stone Co.,**
Carey, Ohio.

**Ohio Hydrate & Supply Co.,**
Woodville, Ohio

**John D. Owens & Son Co.,**
Owens, Ohio.

**Woodville Lime Products Co.,**
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**Merion Lime & Stone Co.,**
Norristown, Pa.

**Vermarco Lime Co.,**
West Rutland, Vt.

**Riverton Lime Co.,**
Riverton, Va.

# For Sale

500 tons new O. H. 105 lb. NYC standard rails with splices.

1000 tons new O. H. 90 lb. ASCE rails with splices. Will quote on entire quantity or on such lots as required for prompt shipment.

**M. MITSHKUN CO.,**
BOOK BUILDING
DETROIT, MICHIGAN

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LOCOMOTIVE CRANES
STEAM SHOVELS
LOCOMOTIVES
CARS
RAILS
HOISTING ENGINES
GRAB BUCKETS
STONE CRUSHERS
COMPRESSORS
ETC.

Try us for honest value in dependable "used" material of this character. We'll treat you right.

**Wm. B. Grimshaw Co.**
1052 Drexel Bldg., Phila., Pa.
Dealers in "Used" but "Not Abused" Machinery

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**FOR SALE**

# Rebuilt Machinery

**For Immediate Delivery**

1—16x32x42 Cross-Compound Murray Rolling Mill Corliss Engine, belt drive.
1—400′ Worthington Surface Condenser.
2—66″x16′ Tubular Boilers.
1—16x36 Double Eccentric Heavy-Duty Fulton Corliss Engine, belt drive.
1—14x20 Atlas Automatic Engine, belt drive.
1—40x60 No. 10 gauge Steel Stack.
1—36x70 No. 10 gauge Steel Stack.
1—5x7½ Vertical Throttling Engine.
1—Induced draft Fan, 60″ diameter, 30″ outlet—steam driven.
1—20x34x28 Tandem Compound Fitchburg Engine, direct connected to 300 KW. direct-current G. E. generator.
1—450 KW. G. E. Alternator, 2300 volts, 3 phase, 60 cycle, direct connected to E. P. Allis Cross Compound Engine; steam driven surface condenser with switchboard panel and instruments.
1—800 KW. G. E. Alternator, 2300 volts, 3 phase, 60 cycle, direct connected to McIntosh & Seymour horizontal heavy-duty engine, 100 RPM.
1—New 350 HP. IXL Open Feed Water Heater, purifier and receiver, with cut-out valve and oil separator.

**H. J. GEBHARDT**
**1421 FISHER BUILDING** **CHICAGO**

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*New and Second Hand Bargains*

# CARLIN'S

**SHEARS DERRICKS**
**GRINDING PANS**
**ELECTRIC HOISTS**
**BUCKETS**

*Same location for 69 years*

**JOHN H. CARLIN MACHINE CO.**
140 Lacock St., N. S., Pittsburgh, Pa.

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# For Sale by Owner

1—American Hoist Engine, 5½″x8″, D. C. D. D., with Sleuthing Attachment & Boiler.
1—No. 5 AUSTIN Gyratory Crusher.
600′ 1¼″ Plow Steel Cable.
1—INGERSOLL-RAND Air Compressor, Imperial type 10, Double Stage, 12x12 & 7½x12, capacity 327 Cubic Feet, direct connected to General Elec. 50 H. P. Motor with Auto Starter and including Receiver Tank and Automatic Unloader.
1—All Steel Derrick with Bull Wheel, and Interchangeable Boom for lengths 30′, 60′, 90′ and 110′.
1—General Elec. 50 H. P. Motor, A. C., 2 phase, 860 R. P. M.

**BETTENDORF STONE COMPANY**
**820 Kirkwood Blvd.** **Davenport, Iowa**

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# BLACK GIANT STITCHED DOUBLE BELTING

THIRTY thousand feet of BLACK GIANT DOUBLE STITCHED BELTING in sizes ten to twenty-four inch eight ply furnished within the last sixty days to two of the largest cement plants in the United States. Both of these plants have used BLACK GIANT DOUBLE STITCHED BELTING for the past five years. BLACK GIANT DOUBLE STITCHED BELTING is the most improved cotton belting manufactured today and is adapted for all kinds of work wherever machinery is run, either for transmission of power, elevators or conveyors.

*Manufactured exclusively by*

**McIlroy Belting and Hose Co.**
**Hammond, Indiana, U. S. A.**

# FOR SALE—The following plant and equipment used on our completed contract for the construction of the Fourth Lock at Sault Ste. Marie, Michigan, for the United States Government.

### STEAM SHOVEL

1—70C Bucyrus steam shovel, 2½-yd. dipper; shop No. 1536. August delivery.

### LOCOMOTIVES

6—Porter locomotives, 11x16 cylinders, four-wheel, connected, saddle tank, 36-in. gauge, 20-ton each, 31-in. diameter driving wheels, 165-lb. boiler pressure, 8760 lb. tractive force. August delivery.

### CARS

34—Western 5-yd. heavy duty two-way dump cars, 36-in. gauge. New in December, 1917. August delivery.

6—Koppel cradle two-way steel dump cars, 36 cu. ft. capacity, 24-in. gauge. Immediate delivery.

12—Koppel steel flat cars, size 19 ft. by 4 ft. 8 in., 36-in. gauge, 30,000 lb. capacity. July delivery.

### BUCKETS

26—Lakewood, 65 cu. ft. capacity, two-line bottom dump concrete buckets. July delivery.

2—Owen type "H" clamshell buckets, 2 cu. yd. capacity. July delivery.

### AIR COMPRESSORS

1—Chicago Pneumatic Tool Co. compressor, size 12x12 GSB, motor drive, shop No. 4760. July delivery.

1—Chicago Pneumatic Tool Co. compressor, size 10x12 GCSC, steam drive, shop No. 5535. Immediate delivery.

1—Chicago Pneumatic Tool Co. gasoline truck mounted compressor, bought new in 1916, excellent condition.

### DERRICKS

1—Steel stiff-leg derrick, 25-ton capacity, 80-ft. boom, with bull wheel. Immediate delivery.

### DERRICKS—Continued

4—Steel guy derricks, 10-ton capacity, 80-ft. mast, 70-ft. boom. Immediate delivery.

1—Traveling derrick, 25-ton capacity, 80-ft. steel boom, with bull wheel. Immediate delivery.

### HOISTS

1—Thomas double-drum electric hoist with 100-hp. D.C. motor. Immediate delivery.

1—Thomas double-drum electric hoist with 50-hp. D.C. motor. Immediate delivery.

### ENGINES

1—Erie stationary horizontal steam engine, size 16x18. Immediate delivery.

1—Leonard-Ball stationary horizontal engine, size 7x10. Immediate delivery.

1—Dean steam condenser, 8x14x12. Immediate delivery.

### ELEVATORS

1—Patnoe steel chain elevator, complete on wood frame, with geared head and driving pulley, 35-ft. centers, 53 elevator buckets 42x19 in. Immediate delivery.

1—No. 8 geared head elevator, complete on wood frame, with 32-in., 8-ply belt, 69-ft. centers, 105 elevator buckets 30x17 in. Immediate delivery.

1—Elevator for handling crushed stone, 32-in., 8-ply MC rubber belt 151 ft. long, 87 malleable iron buckets. July delivery.

### CONVEYORS

1—Belt conveyor for handling crushed stone, belt traveling on troughing idlers, rubber belt 714 ft. long, 6-ply. July delivery.

1—Conveyor with two lengths 370 ft. each of 18-in., 4-ply Sawler belting, including pulleys, etc. (Used for conveying cement bags.) Immediate delivery.

### MIXERS

2—Ransome 2-cu. yd. capacity concrete mixers, type No. 64, with 50-hp. A.C. motor. July delivery.

### DRILLS

4—Leyner-Ingersoll piston type steam drills. Immediate delivery.

2—Ingersoll-Rand "Bull Moose" BCR type drill. Immediate delivery.

1—Ingersoll-Rand "Jap" BCR type drill. Immediate delivery.

4—Ingersoll-Rand rock drills, complete with weights and tripods. Immediate delivery.

### MOTORS

1—General Electric 35-hp. A.C. induction motor, with automatic starter, 220 volts. July delivery.

1—Western Electric 35-hp. A.C. motor, 220 volts, with self-starting automatic compensator. July delivery.

1—General Electric 50-hp. A.C. induction motor, 220 volts, with starting compensator. August delivery.

### PUMPS

2—Yeoman's 1½-in. horizontal, single suction, enclosed impeller centrifugal pump, capacity 100 GPM., 70-ft. head, with 5-hp., 3-phase, 220 volts motors. August delivery.

1—Yeoman's 4-in. Class "M" double suction horizontal centrifugal pump, capacity 500 G.P.M., 100-ft. head, with 25-hp., 3-phase G. E. motor. August delivery.

### MISCELLANEOUS

1—35-hp. General Electric D.C. motor, shop No. 152368 C.L. 35 form B., 135 amps., 220 volts, speed 610, with starting rheostat 35 hp., 220 volts, 250 normal, 125 amps., Cutler Hammer Mfg. Co. Excellent condition.

All of the above plant and equipment is in excellent operating condition and available for inspection. For further particulars and complete list address *Oscar Daniels Company, First National Bank Bldg., Chicago, Ill.*

# Sound Plant in Good Operating Condition For Sale

### AIR COMPRESSORS

1—2-cylinder 6x6 belt driven Gardner-Rix, capacity, 80 ft. per minute.
2—Ingersoll-Sergeant Class A, 18 x 8¼ x 24 Straight Line, steam-driven, 650 ft. per minute at 100 lb.
1—Rand Duplex, steam-driven, 600 ft. capacity with receiver.

### BOILERS

4—50-hp. locomotive type.
4—Vertical tubular. 1—12-hp. 1—15-hp. 1—20-hp.

### CABLEWAY

1—Lambert, 6-ton, 900-ft. span.

### CENTRIFUGAL PUMPS

1—18-in. Morris direct connected to double vertical steam engine.
1—10-in. Buffalo, double suction, belt driven.
1—15-in. Buffalo, belt driven.
1—20-in., belt-driven Worthington Turbine.

### DUMP CARS

20—3-yd. Peteler, 36-in. gage.
20 pairs of wheels and axles, for 4-yd. Western, extra heavy, brand new.

### ROCK DRILLS

100—McKiernan-Terry "Wizard" Rock Drills, 2¼ to 3-in., with tripods for air or steam, all brand new.

### FIRE PUMP

1—Worthington Duplex Fire Pump, 18½x9¼ x10, capacity 610 gallons per minute.

### CONCRETE MIXERS

2—Ransome, 1-yd. on skids, with steam engine, but no boiler.

### HOISTING ENGINES

1—10x12 Lidgerwood compound geared to drum 41x52-in. Has 25-ton pull. Suitable for mine work.
2—American, 7x10, double cyl., 2 drum, with boom swinger, but without boiler.
2—7x10 American D. C. D. D., with swingers and boilers.

**Locomotives, Drills, Pumps, Steam Shovels, Etc.**

***All thoroughly overhauled and ready for immediate and constant service.***

**UNITED STATES EQUIPMENT CO.,** 208 South LaSalle Street, Chicago.

# READY FOR SHIPMENT

### LOCOMOTIVE CRANES

1—12-ton Orton and Steinbrenner, 8-wheel, M. C. B. 40-ft. boom, bucket drums.

### LOCOMOTIVES

2—Baldwin, standard gauge, saddle tanks; one 33-ton, the other 35-ton; cylinders of both 14x24; four driver type; Hunt's inspection certificate of approval furnished.
Baldwin, 7½ ton, 24-in. gauge, saddle tank.

### AIR COMPRESSORS

Ingersoll-Rand duplex, two-stage, steam driven, capacity 1,190 ft. air at 110 lbs. pressure.
1—Rand belt driven air compressor, capacity 300 ft. air at 100 lbs. pressure.

### CONCRETE MIXERS

2—Marsh-Capron ¾-yard, with steam engines and boilers mounted on wheels. Charging hoppers or side loaders.
1—Marsh-Capron 1 yard, mounted on steel skids (no power), charging hopper, electric or steam power can be applied.
1—No. 4 Smith with steam engine on skids.
1—Lot concrete spouting, size 14½" wide, 9¾" deep; hopper connections.

### CARS

4—1-yard capacity "V" shaped steel two-way dump, 30" gauge.
2—24" gauge Orenstein Arthur Koppel Dump Cars.

### BOILERS

4—200 H. P. (Heine type) water tube boilers.

### MINE HOISTS

Lambert, 10x12 double cylinder, single drum, 36-in. dia., 24-in. face. Drum grooved, will take up ⅞-in. cable. Drum flanges 8 in. deep. Link motion.
Brownhoist, 9x12 double cylinder, single drum, 48-in. dia., 36-in. face, friction type. Drum grooved for ⅝-in. dia. cable.

### DERRICK HOISTS

1—American 5½x8 double cylinder, double drum with boiler.
1—National 7x10 double cylinder, double drum, with boiler.
1—Flory, 7x10 double cylinder, double drum, with boiler.
2—Byers, 16 H. P. double cylinders, double drum, equipped with boilers and swinging gears.

### VULCAN HAMMER

1—No. 1 Vulcan steam pile hammer with McDermid base.

### WIRE ROPE

450 ft. ¾-in. (one piece) plow steel.
200 ft. ⅝-in. (one piece) plow steel.
312 ft. ⅝-in. (one piece) plow steel.
500 ft. ⅝-in. (one piece) plow steel.
850 ft. ⅝-in. (one piece) plow steel.
257 ft. ⅝-in. (one piece) plow steel.
850 ft. ⅝-in. (one piece) plow steel.

### PORTABLE TRACK

About 500 ft. of 20-lb. portable track and rails in 15-ft. sections.

## F. MAYER

**1601 Monadnock Building** **CHICAGO, ILL.**

# BARGAINS
## Immediate Delivery

### HOISTS

8¼x10 in. Morrison, D.C., D.D.
7 x10 in. Stroudsburg, D.C., S.D.
9½x12 in. Lambert Cableway Engine

### ELECTRIC HOISTS

75 H.P. Flory, 3 drums and swinger, 440 volt, 60 cycle.
40 H.P. Lambert, D.D., 220 volt, D.C.
21 H.P. Lidgerwood, D.D., 550 volt, D.C.

### CRUSHERS

9x16 in. Climax.
10x22 in. Climax.
9x15 in. Champion
No. 5 Austin
Also several rotary screens

### BUCKETS

6—2½-yd. Lockwood bottom dump.

### COMPRESSORS

16x16x24x18 in. Ingersoll, 2 stage
10x 8x10x16x10 in. McKiernan, 2 stage
12x12x18 in. Laidlaw, straight line
12x12x12 in. Ingersoll, straight line
10x12x10 in. Ingersoll, straight line
16x10x10 in. Ingersoll, 2-stage, belt driven

**Also Pipe, Suction Hose, Etc.**

**WICKES MACHINERY CO.**
Claremont and West Side Aves.
Jersey City, N. J.

# For Sale—Immediate Delivery

*Owned By Us and Sold Under Absolute Guarantee*

### STEAM SHOVELS

1—95-C Bucyrus, shop number 1302.
5—70-C Bucyrus, shop numbers 1474, 1351, 1126, 1287, 1245, 2½-yd. dippers.
2—Standard 70-ton Bucyrus, shop numbers 733 and 572, 2½-yd. dipper.
2—45-C Bucyrus, shop numbers 1297, 1202; 1½-yd. dippers.
1—Model 60 Marion, shop number 1685.
1—85-C Bucyrus, shop number 1647, 4-yd. dipper.

### DRAG LINES

1—No. 2 Monighan and one Lidgerwood, on skids and rollers. 60-ft. boom, 2-yd. buckets.
1—Class 24 Bucyrus dragline on skids and rollers, 100-ft. boom, 3½-yd. bucket, equipped with electric light plant, also two extra buckets and a large amount of extra parts.
1—No. 1 Monighan all steel gasoline machine, mounted on walking device, equipped with 40-ft. boom and 1-yd. Page bucket.

### DUMP CARS

20—16-yd. standard gage Western air dump cars, with steel lined floors.
50—12-yd. standard gage, Western air dump.
15—12-yd. standard gage Oliver air dump.
100—3-yd. and 4-yd., 36-in. gage Western cars.
30—1½-yd., 24-in. gage.
7—Heavy duty, 4-yd. Western, 36-in. gage dump cars.

### LOCOMOTIVES

1—17x24 10-wheel Baldwin; Driving wheel centers 50"; driving wheel base, 13' 10"; weight on drivers, 84,000 lbs.; total weight, 164,000 lbs.; steam pressure, 180 lbs. Overhauled October 1, 1917. First class condition.
1—6-wheel 17x24 Big Four Switcher, with 8-wheel tender; weight on drivers, 87,200 lbs.; steam pressure, 140 lbs.; wheel base, 13' 8"; tractive force, 16,200 lbs. Now being overhauled. Ready for delivery 10 days.
1—16x24 4-wheel Davenport Switcher, with 8-wheel tender. Weight on drivers, exclusive of tender, 37 tons—47½ tons including tender. New in 1914. Has seen very little service.
1—11x16 cylinder 21-ton standard gage Davenport saddle tank locomotive. New in 1912. Westinghouse air brakes, automatic couplers, steam pressure, 165 lbs.
2—11x16 cylinder, 36" gage, Davenport saddle tank dinkies, practically new.
1—10x16 cylinder 18-ton standard gage Davenport saddle tank locomotive; automatic couplers, steam brakes, steam pressure, 145 lbs.
1—16x22 4-wheel switcher, C. M. & St. P., J-2 class, weight, 32 tons.
1—18x26, 8-wheel passenger type locomotive, Schenectady build; total weight, 51 tons; weight on drivers, 33 tons.
5—36-in. gage, 10x16 and 9x14 Davenport saddle tank locomotives.
2—7x12 in., 24-in. gage Davenport, shop number in the twelve hundred.

### REVOLVING TRACTION SHOVELS

1—25B Bucyrus traction shovel, shop number 1850, 1¼-yd. dipper; also special long dipper arm and ⅞-yd. dipper in addition to the standard equipment.

### RAIL, SWITCHES, SPIKES, ETC.

30—Complete switches for 60-lb., 70-lb. and 75-lb. rail, complete with target switch-stands, frogs, points, etc.
1—Carload 4½", 5" and 5½" spikes.
10 tons angle bars for 70-lb. and 75-lb. rail.
100 tons 52-lb. rail.

### SPREADER CARS

1—Standard Western spreader, almost new.
1—Standard, all-steel Jordan air spreader.

### SHOP EQUIPMENT

3—Brownell, 72"x18', Horizontal Tubular Boilers, with 4" tubes.
2—20x22¼x14¼x21 AA2 Ingersoll-Rand Compressors, complete with fittings.
1—20x22¼x15¼x21 AA1 Ingersoll-Rand Compressor.
1—66x18 Vertical air receiver, complete.
1—30x6 Vertical air receiver, complete.
1—16x16x18-in. Laidlaw-Dunn-Gordon Air Compressor with reservoir, weight 15,000 lbs.
1—Tire Lathe, 52-in. Swing, complete with countershaft.
1—Stationary Engine; horizontal center crank type; 10x12-in. cylinder, slide valve type; 25 H. P.

## CLAPP, NORSTROM & RILEY EQUIPMENT CO.

**12 and 14 South Canal St., Chicago** **Northwestern Branch: 1308 Pioneer Bldg., St. Paul, Minn.**

### QUARRY FOREMAN WANTED

"First class quarry foreman wanted" for Cement plant quarry in west. Address A. B. C., c/o Cement and Engineering News, 672 Transportation Bldg., Chicago, Ill.

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Wanted, First-Class Rock Quarry Foreman, a real man who can take charge of a quarry and actually knows how to get the rock out and push the work. Address Canadian Cement Manufacturer, care of Cement & Engineering News, 672 Transportation Bldg., Chicago.

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Wanted for sand plant, a machinist or millwright who is familiar with a boiler, engines, etc., and competent to repair dryer, screen, shafting, elevators, etc. Good salary, an all-year job and suitable living conditions. Address L. & L., care of Cement & Engineering News, 672 Transportation Bldg., Chicago.

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Experienced Cement Chemist wanted. Must be capable of acting as assistant manager. Address R-C. C., care of Cement & Engineering News, 672 Transportation Bldg., Chicago.


## USED MOTORS

**For immediate Delivery—Overhauled and Guaranteed—Largest Stock in America to Choose From. For Sale: 3 Phase, 60 Cycle, 220 V.**

| H.P. | | Speed |
|---|---|---|
| 1— 3 | —General Electric | 1800 |
| 1— 3 | —Westinghouse | 1200 |
| 1— 5 | —Wagner | 1800 |
| 1— 5 | —Allis Chalmers | 1200 |
| 1— 7½ | —General Electric | 1800 |
| 1—10 | —Westinghouse | 900 |
| 2—15 | —Westinghouse, Type CCL | 1750 |
| 2—15 | —Watson, slip-ring, var. speed | 1720 |
| 1—15 | —Fairbanks-Morse | 1200 |
| 1—15 | —General Electric, Form L | 1200 |
| 1—15 | —General Electric | 1200 |
| 3—15 | —Fairbanks-Morse, slip-ring, constant speed | 1200 |
| 1—15 | —Westinghouse, vertical | 1135 |
| 2—15 | —Allis-Chalmers | 1130 |
| 2—15 | —Allis-Chalmers | 860 |
| 2—15 | —Westinghouse | 850 |
| 4—20 | —Westinghouse | 1750 |
| 1—20 | —General Electric | 1200 |

Send for MONTHLY BARGAIN SHEET Showing Complete Stock and Net Prices.

GREGORY ELECTRIC CO.
16TH AND LINCOLN ST
CHICAGO, ILLINOIS

Capital and Surplus, $500,000.00


### WANTED

Quarry Foreman, Cement plant, Eastern Pennsylvania—Steam shovel operation. State fully experience, reference and salary. Answer to Box C. C. H., c/o Cement & Engineering News, 672 Transportation Bldg., Chicago, Ill.

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Wanted: Complete second-hand cement plant, machine shop and laboratory outfit; must be in first-class condition. Address R. C. C., care of Cement & Engineering News, 672 Transportation Bldg., Chicago.

### NO. 8 GATES BALL MILL FOR SALE

This Ball Mill has never been used. Complete with feeder, charge of balls and driving pulley. Price $4,500.00 for immediate sale. Address Box 142, c/o Cement & Engineering News, 672 Transportation Bldg., Chicago, Ill.

### WANTED

Wanted at Once—Operating superintendent for a large dry process Rock and Shale plant in the East. Must have mechanical and executive ability. State age, past experience, position in draft, references and salary expected in first letter. Box 69, c/o Cement & Engineering News, 672 Transportation Bldg., Chicago, Ill.


### COMPRESSORS

| | Price |
|---|---|
| 1—12x12 Laidlaw-Dunn Gordon, belt driven, capacity 300′ | $ 750 |
| 1—12x12x16 Ingersoll, straight line, steam driven, capacity about 300′ at 80 to 100 lb | 600 |
| 1—Sullivan, 2 stage air, simple steam, capacity 1800′ at 80 to 100 lb | 2,500 |
| 2—14x12 Bury Duplex, belt driven, capacity about 550′ at 60 to 80 lb., each | 1,000 |
| 1—14x16x10x16 Sullivan, 2 stage air, simple steam, capacity 600′ at 80 to 100 lb. | 1,500 |
| 1—14x9x10 Bury, 2 stage, belt driven, capacity 350′ | 1,500 |
| 1—Ingersoll-Rand Imperial Type XB2, 500′ | 2,000 |
| 1—Sullivan 2 stage, belt driven, 1400′ good as new, f. o. b. St. Louis | 4,500 |

### CARS

| | |
|---|---|
| 20—4 yd. Western, 2 way, contractors, 36″ gauge, wooden bodies, each | $ 125 |
| 70—2½ yd. steel bodied, end dump quarry cars, 36″ gauge, each | 80 |
| 30—2½ yd. steel bodied, end dump quarry cars, 48″ gauge, each | 75 |
| 20—12 yd. Western, standard gauge MCB, air dump cars, almost new, each | 1,050 |
| 20—12 yd. Western, standard gauge MCB, air dump cars, good condition, each | 900 |
| 50—1½ yd. Koppel "V"-shaped, 24″ gauge, steel cars, new, each | 120 |

### CRUSHERS

| | |
|---|---|
| 1—No. 9 Style "K," almost new | $7,000 |
| 2—No. 5 Austins, one straight and one angle drive, both fine condition, each | 1,500 |
| 1—No. 6 Style "D" Gates, fine condition | 2,000 |
| 1—No. 7½ Austin, almost new | 2,500 |
| 1—10x20 Blake jaw crusher on skids | 800 |
| 1—9x16 Good Roads Machinery, jaw crusher on wheels, with 22′ elevator. | 800 |
| 1—9x16 Universal on skids, almost new. | 500 |
| 1—No. 7½ McCully | 3,000 |
| 1—No. 5 McCully | 1,500 |

### ELEVATOR AND SCREENS

| | |
|---|---|
| 1—No. 5 Gates 70′ centers, almost new. | $ 700 |
| 1—No. 7½ Austin 62′ centers, fine condition | 900 |
| 1—No. 9 with 36″ buckets, good condition, without belt | 900 |
| 1—Stephens & Adamson stone screen, 42″x16′, with dust jacket, practically new | 700 |
| 1—48x18 Austin screen with dust jacket | 800 |
| 1—48x20 McCully screen with dust jacket | 900 |

### CLAM SHELL BUCKETS

| | |
|---|---|
| 1—¾ yd. Owen with teeth, almost new | $450 |
| 1—1½ yd. Hayward, first class | 650 |
| 1—1 yd. Browning | 500 |
| 1—1½ yd. Page Dragline | 500 |

### CRANES

| | |
|---|---|
| 1—7 ton, 4 wheel Vulcan Bucyrus single line crane | $ 6,000 |
| 1—10-ton Browning 4 wheeled, with bucket | 7,000 |
| 1—15 ton Brown hoist, with 50′ boom, 8 wheeled MCB, with 2 yd. Brown hoist, clamshell | 17,500 |
| 1—20 ton Brown hoist, 8 wheel MCB, 50′ boom, and bucket | 18,000 |
| 1—25 ton Browning hoist, 8 wheel MCB, 50′ boom, and bucket | 21,000 |

### HOISTING ENGINE

| | |
|---|---|
| 1—6¼x10 American DCDD, with boiler. | $1,000 |
| 1—7x10 Lidgerwood DCDD, with boiler | 1,100 |
| 1—7x10 Lambert, 3 drum, with boiler | 1,600 |
| 1—8x12 Mundy DCDD, with boiler | 1,300 |
| 1—9x10 Lidgerwood, 3 drum, 32″ drums, without boiler | 1,900 |
| With boiler | 2,300 |
| 1—Clyde 9x10, 3 drum with boiler, f. o. b. Mich. | 2,500 |
| 1—5x8 DCDD Reversible O&S, with vertical engine, without boiler | 350 |
| With boiler | 550 |
| 1—7x10 Lambert DCDD, with boiler | 1,100 |

### LOCOMOTIVES

| | |
|---|---|
| 1—9x14 Vulcan, 36″ gauge, saddle tank. | $1,250 |
| 1—9x14 Vulcan 36″ gauge, saddle tank. | 1,350 |
| 1—10x16 Vulcan 36″ gauge, saddle tank. | 1,600 |
| 1—10x16 American 36″ gauge, saddle tank, good as new | 1,850 |
| 1—19x24 Baldwin, 10 wheeler, 60 tons. | 8,000 |
| 1—18x24 American, 10 wheeler | 5,000 |
| 1—17x24 6 wheel switcher | 5,000 |
| 1—14x24 Pittsburgh, saddle tank standard gauge with separate tender | 4,000 |

### DRAGLINES

| | |
|---|---|
| 1—Monighan-Walker steam machine, with 50′ boom, 1½ yd. bucket, almost new | $7,000 |
| 1—Flory outfit engine 10x12 heavy dragline type boiler, fire box 150 lb. pressure, boom 60′, steel bucket, 2 yd. New 1917 | 9,000 |
| 1—24 Bucyrus, with 85′ boom | |

### RAIL

| | Price |
|---|---|
| 400 tons—35 lb., with angle bars | $57 |
| 1500 tons—56 lb., with angle bars | 58 |
| 100 tons—75 lb., with angle bars | 55 |

### PUMPS

| | |
|---|---|
| 1—10″ Morris, sand, belt drive | $ 500 |
| 1—8″ Morris, water, belt drive | 300 |
| 1—20x10x14 Worthington duplex | 600 |
| 1—Wilson-Snyder water works pump, complete with condenser | 2,000 |

### STEAM SHOVELS

| | |
|---|---|
| 1—No. 0 Thew on standard gauge railroad truck, ⅝ yd. dipper | $2,500 |
| 1—No. 0 Thew traction with ⅝ yd. dipper, fine condition | 4,000 |
| 1—14B Bucyrus traction with ⅝ yd. dipper, almost new | 4,000 |
| 1—18B Osgood traction with ¾ yd. dipper, high boom, one year old | 5,000 |
| 1—No. 1 Vulcan revolving shovel, standard gauge with ¾ yd. dipper, good as new | 4,500 |
| Same as above, with 35′ crane boom | 5,500 |
| 1—45 ton Bucyrus, standard gauge, 1¾ yd. dipper | 6,500 |
| 1—Model 60 Marion with 2½ yd. dipper | 7,000 |
| 1—65 ton Bucyrus with 2½-yd. dipper | 5,000 |

### CABLEWAYS

| | |
|---|---|
| 1—9x10 Lidgerwood, 3 drum engine and boiler and carriage and part of other fittings, no rope | $3,000 |
| 1—50 hp. Flory DD electric with carriage and fittings, but no rope | 3,000 |
| 1—7x10 Flory steam DCDD with boiler, carriage and all fittings, but no rope | 1,950 |

### BOILERS

| | |
|---|---|
| 1—25 hp. vertical American hoist and derrick | $250 |
| 1—40 hp. firebox on steel truck | 550 |
| 1—50 hp. vertical butt strap | 750 |
| 1—60 hp. vertical Lidgerwood | 800 |

### MOTORS

| | |
|---|---|
| 1—20 hp. Westinghouse, 60 cycle, 3 phase, 220 volt | $400 |
| 1—30 hp. Westinghouse, 60 cycle 3 phase, 2200 volt | 450 |
| 1—35 hp. Westinghouse, 60 cycle 3 phase, 2200 volt | 500 |
| 1—50 hp. General Electric, 60 cycle 3 phase, 220 volt | 750 |

## MACHINERY WAREHOUSE & SALES COMPANY,

*Successor to* GEO. C. MARSH & Co.

**Tel. Harrison 5799**

**750 Old Colony Bldg, Chicago**

# Complete Road Builders' Outfit For Sale

1—**20 hp. Reeves Engine.**
2—**Western Elevating Graders.**
25—**Western 1½ yd. Dump Wagons.**
2—**No. 16 Koehring Concrete Mixer,** steam driven, traction, paving type, with boom and bucket.
1—**½ yd. Austin Cube Concrete Mixers,** steam driven, traction, paving type, with boom, bucket.
1—**5 ft. Fairbanks,** gas driven, low charging, **Concrete Mixer.**
**7992 lin. ft. Heltzel Pat. Steel Forms,** 6 in. high.
**56 doz. Heltzel Pat. Hanging.**
2—**New Economy Sack Balers.**
1—**Warehouse Truck,** 2 wheeled.
1—**Warehouse Truck, Fairbanks.**
2—**Concrete Paving Rollers,** 10 ft.
2—**Any weight Hand Rollers,** Max. wt. 300 lb.
2—**Gravity Brick Conveyors.**
2—**O. K. Harry Steel Water Tanks,** 6 ft. x 8 ft.
1—**O. K. Harry Steel Water Tank,** 4 ft. 6 in. x. 3 ft.
1—**O. K. Harry Water Wagon and Pump.**
1—**Diaphragm Pump.**
1—**No. 3 C. H. & E. Piston Force Pumps,** 2½ in. disch.
1—**Fairbanks 2 hp. Triplex,** 1 in. disch. **Pump.**
**Water Pipe with sleeves.**
1—**5-ton Kelly Springfield,** steam power **tandem roller.**
1—**No. 684 Western Graders,** 8 ft. blade.
1—**Little Western Grader,** 6 ft. blade.
8—**Western 2 wheeled Scrapers.**
4—**Maywood (Mormon) Scrapers.**
3—**No. 2 Drags, Westerns.**
6—**No. 3 Drags, Westerns.**
3—**No. 2 Michigan Scrapers.**
1—**4 Horse Western Plow.**
1—**2 Horse Western Plow.**
1—**24 in. Disc.**
1—**2 Horse Steel Jno. Deere Plow.**
2—**Western Rooters, No. 20.**
1—**Western Rooter, Giant.**
43—**Western Dump Cars,** steel frame, 24 ga., 1½ yd.
14—**Western Dump Cars,** wood frame, 24 ga., 1½ yd.
3—**Brick Wagons.**
3—**Sterling Trucks,** 2½ ton, Steel Dump Bodies, Wood Hoist, 2 months' use.
3—**Frogs, Switch Points and Throws,** 20-lb. rail.
1—**Track Tools.**
2—**Sheets Steel, 7 Steel Ties with Bolts, 4 Axles and Wheels,** for jumping crossing.
1—**Johnson Car Replacers.**
1—**Automatic Trip Jack.**
4—**Western Portable Telescoping Bins,** 20-yd. cap.
1—**Owen Clamshell Bucket,** ¾ yd.

The above equipment is located in Illinois, and at Granite City, Illinois, and St. Louis, Mo.
Prices Quoted are F. O. B. Cars at point of shipment.
Terms: Sight draft attached to bill of lading or terms on approved credit.
The equipment is in first-class working condition for used outfits, and is subject to inspection at point of shipment.
The equipment is offered subject to prior sale.

## Granite City Lime & Cement Company

**20th and A Streets, Granite City, Illinois**


# BUYERS' DIRECTORY OF MANUFACTURERS OF MACHINERY, EQUIPMENT AND SUPPLIES

### Aerial Carrier
Ruggles Machine Co.

### Ball and Tube Mills
Allis-Chalmers Mfg. Co.
Bonnot Co.
F. L. Smidth & Co.
Traylor Eng. & Mfg. Co.

### Belting
McIlroy Belting & Hose Co.
Sawyer Belting Co.
Victor Balata & Textile Belting Co.

### Buckets—Clam Shell
Link-Belt Co.

### Burial Vault Molds
Automatic Sealing Vault Co.

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Ideal Concrete Machinery Co.

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Allis-Chalmers Mfg. Co.
Bonnot Co.
Bradley Pulverizer Co.
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The Jeffrey Mfg. Co.
F. L. Smidth & Co.
Sturtevant Mill Co.
Traylor Eng. & Mfg. Co.
Williams Pat. Crusher & Pulv. Co.

### Chemical Apparatus
Henry Heil Chemical Co.

### Chimneys
Weber Chimney Co.

### Clutches
A. Plamondon Mfg. Co.

### Concrete Block Machinery
W. E. Dunn Mfg. Co.
Republic Iron Works.

### Concrete Mixers
American Cement Machine Co.
Archer Iron Works.
F. C. Austin Co.
W. E. Dunn Mfg. Co.
Ideal Concrete Machinery Co.
Jaeger Machine Co.
Kent Machine Co.
Northwestern Steel & Iron Co.
Republic Iron Works.

### Conveyors and Elevators
H. W. Caldwell & Son Co.
B. F. Gump Co.
Jeffrey Mfg. Co.
Link-Belt Co.

### Cranes, Locomotive
Link-Belt Co.

### Crushers
Allis-Chalmers Mfg. Co.
Austin Mfg. Co.
Chalmers & Williams, Inc.
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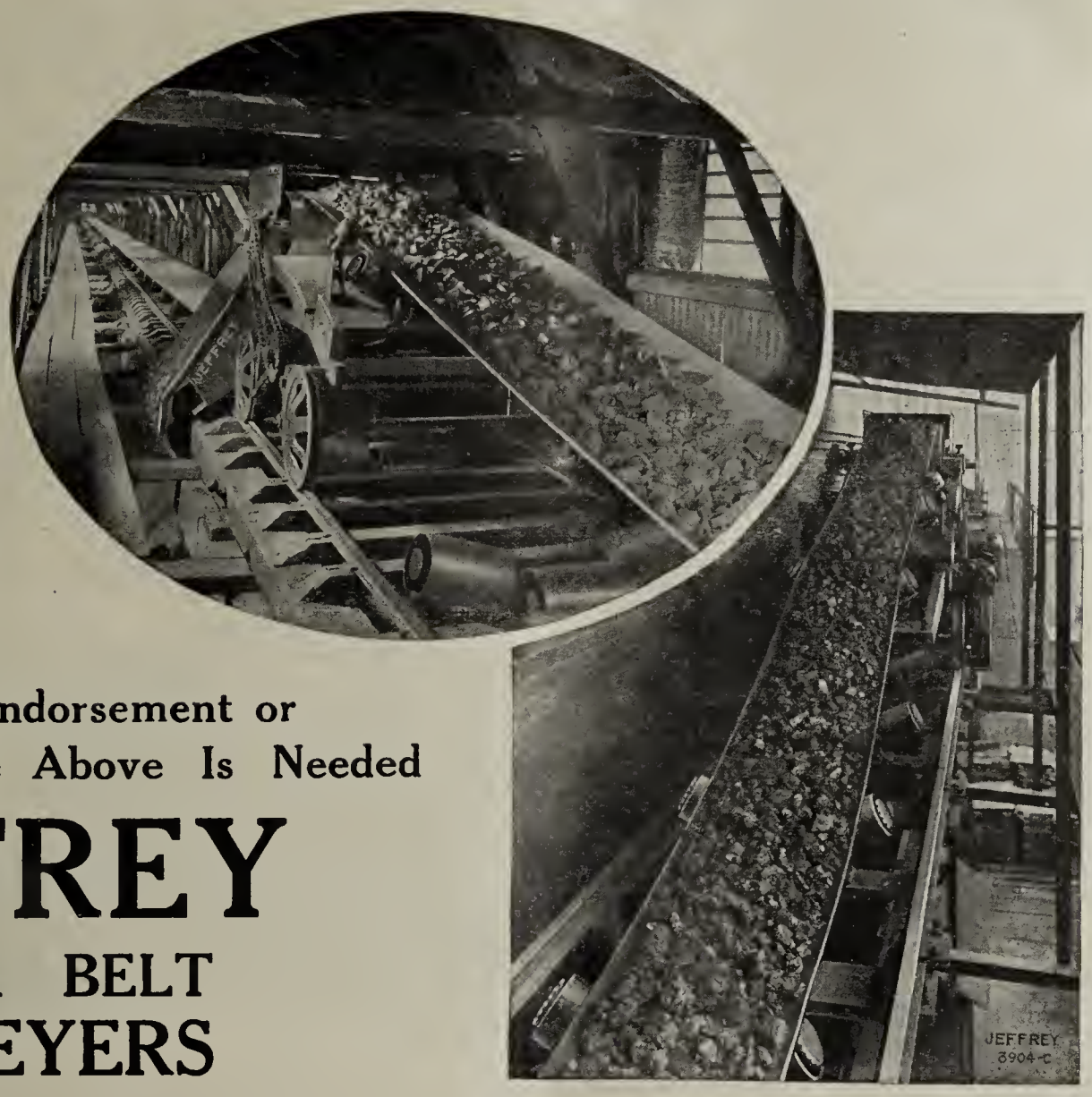


Handling Coal to Storage Bins in Power Plant

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"Our" Century Belts, as well as the carriers used, are designed especially for the hard service of conveying Rock, Ores, Stone, Gravel, Coke, Coal, and other heavy materials, and therefore are a composite of the best of materials and practical engineering service.

The various types of Jeffrey Trippers for automatically distributing over a given space or discharging materials at any fixed point are so designed as to occupy minimum space above the belt; operate with minimum horsepower, and insure a minimum of care and upkeep.

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New York Philadelphia Scranton Chicago Birmingham Milwaukee Seattle Boston
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# CEMENT AND ENGINEERING NEWS

with which Gravel & Stone Magazine is incorporated

(PUBLISHED MONTHLY)

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Advertising copy or changes in ads. must be in this office by the 25th of each month, as hereafter our magazine will appear on the 5th of the following month

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Vol. 30 CHICAGO, SEPTEMBER, 1918 No. 9

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## "Caldwell" Silos

are ousting all others, because "Caldwell" Agents can give the Farmer *more for less money.*

**No Territory to Buy**
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*Write Us.*

**Co-operative Concrete Construction Company**

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STITCHED CANVAS BELTING

gives the best service in the cement plant. It has the endorsement that experienced manufacturers have placed upon it.

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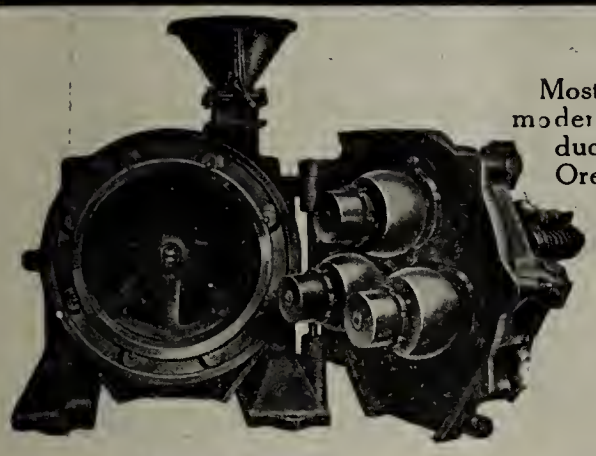

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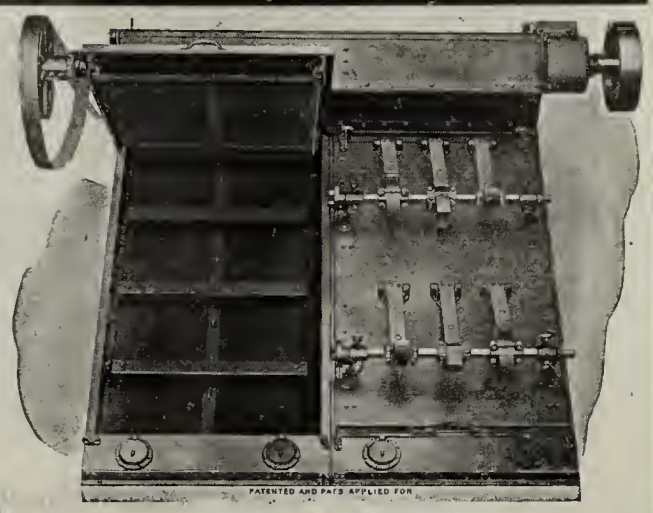


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**SWING-SLEDGE MILLS**

The greatest producers known on Limestone, Lime, Shells, Chemicals, Talc, Clay, Chalk, Bark, Rosin, Sulphur, Coal, Salt, and many other moderately hard and soft materials. High Speed Pulverizers, crushing by a series of blows delivered at high speed against the material fed into the machine.

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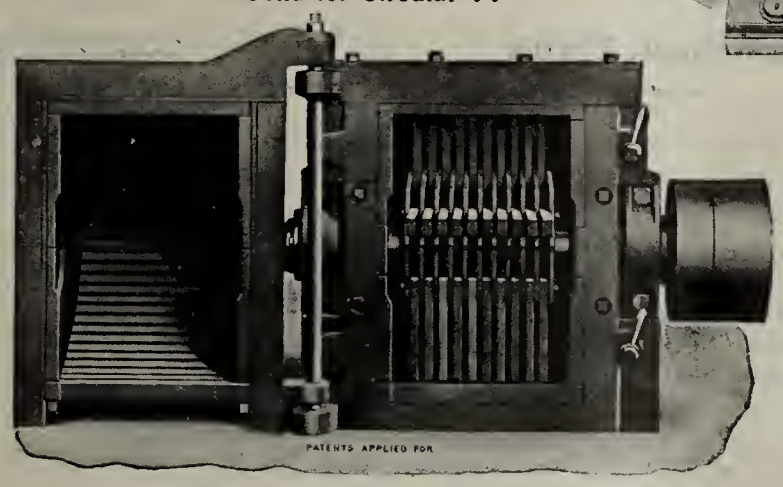


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LINE OF

**CRUSHING, GRINDING, SCREENING, WEIGHING, SACKING, ELEVATING AND MIXING MACHINERY**

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**210 to 214 South Fourth Street, ST. LOUIS, MO.**

We make a specialty of supplying cement works with

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Gilmore's Needles, Cement Moulds, Vicat Apparatus, Schumann's, LeChatelier's and Jackson's Specific Gravity Apparatus, Etc.

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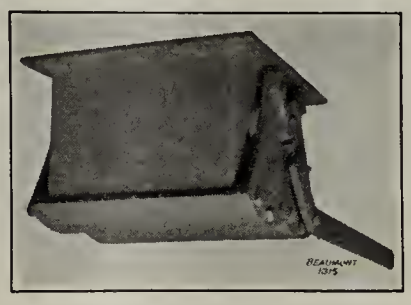
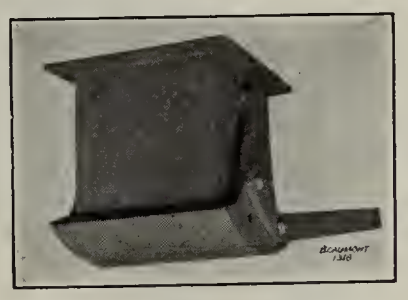


DUPLEX GATE



SIMPLEX GATE

# Beaumont Bin Gates

**These Gates are made of best quality cast iron, of excellent workmanship. They are usually fitted with hand lever, but can be furnished with any type of control demanded by the conditions.**

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**BEAUMONT MFG. CO.**

**460 Chestnut St., Philadelphia, Pa.**

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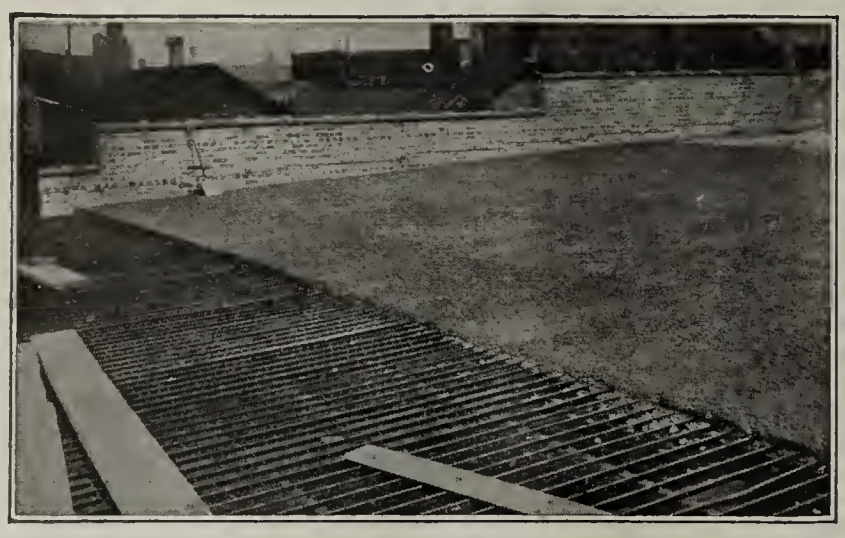
# No Forms Required if T-Rib Chanelath Is Used



Concrete Floors Without Forms

Concrete Walls Without Forms

THE use of T-Rib Chanelath means conservation of lumber and economy in construction because the mesh of Chanelath acts as a form for concrete floors, roofs and walls. At the same time the rigid T-Rib provides all of the reinforcement necessary for the larger percentage of jobs. The efficiency of the T-Rib as a reinforcing member cannot be questioned. The concrete flows around the head of the T and forms a perfect mechanical bond.

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## North Western Expanded Metal Company

***Members of the Associated Metal Lath Manufacturers*** **Old Colony Building, CHICAGO, ILLNOIS**

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# PERCOPROOF COMPOUND

## Makes Foundations impervious to Moisture : : : :

APPLIED with a brush direct to foundation walls, concrete construction, masonry or stucco surfaces, Percoproof forms an unbroken, elastic facing that fills every pore and crack and prevents all seepage and moisture from penetrating.

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Unlike ordinary waterproofing materials, Percoproof contains no oil and requires no thinning. It comes ready for use and is equally satisfactory in all climates and at all seasons.

**Eight Thousand Gallons of Percoproof were used for waterproofing the eighteen great buildings that constitute the Cincinnati General Hospital.**

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The "Easy to clean," Patented **"High Speed"** Mixing and Discharge Action is one of the few that **successfully** and **fast** handles

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Get our astonishingly low prices on these sturdy, built-of-steel mixers—also our Terms. 6 and 11-ft. sizes—also with Loaders. Quick deliveries from stock carried in all large cities. Write nearest office

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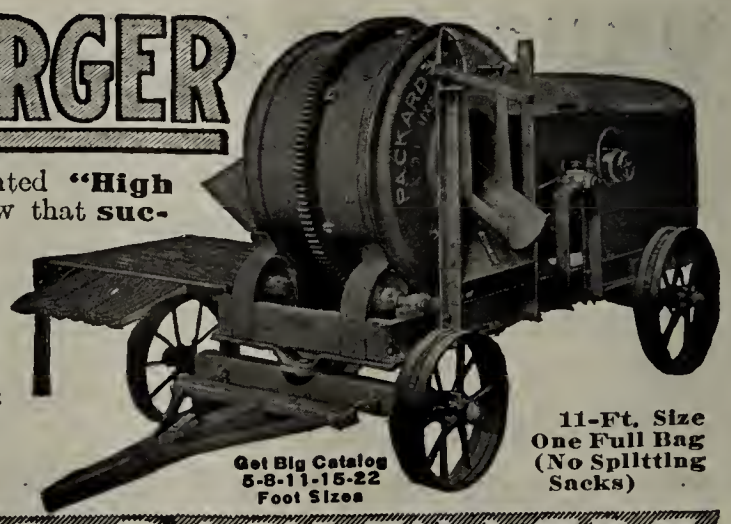


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11-Ft. Size One Full Bag (No Splitting Sacks)

PAVERS—GROUTERS—HOISTS—BACK FILLERS

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THIRTY thousand feet of BLACK GIANT DOUBLE STITCHED BELTING in sizes ten to twenty-four inch eight ply furnished within the last sixty days to two of the largest cement plants in the United States. Both of these plants have used BLACK GIANT DOUBLE STITCHED BELTING for the past five years. BLACK GIANT DOUBLE STITCHED BELTING is the most improved cotton belting manufactured today and is adapted for all kinds of work wherever machinery is run, either for transmission of power, elevators or conveyors.

*Manufactured exclusively by*

**McIlroy Belting and Hose Co.**

**Hammond, Indiana, U. S. A.**

**2-Yard Clam Shell Bucket**

**McMyler-Interstate Class "M" Two line; weighs about 4600 lbs.**
**Condition Like New—Used But Thirty Days**
**$775.00 f.o.b. Chester, Pa.**
Inquiries are solicited for Steam Shovels, Locomotives, Cars, Rails, Hoists, Derricks, Etc.

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Dealers in
"Used" but not "Abused" Machinery

1⅝ IN. HY-RIB (SEVEN-RIB). Ribs 1⅝ in. high, 4 in. apart; sheets 24 in. wide.

# Insure Your Building Results

by using the complete line of material for use in all types of construction. Be sure of prompt delivery, as our complete stocks and large organization warrant immediate shipment.

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the acknowledged standard material, as used everywhere in all kinds of construction work.

The many depths, gauges and types of Hy-Rib adapt it to reinforcement of concrete floors and roofs. It is an ideal plastering surface for walls and ceilings and renders the building entirely fireproof. Easily put in place and on arched and curved work it is furnished bent to the exact curve.

Our complete line includes, in addition to the above, Diamond Lath in two types; Pressed Steel Channels and Studs of all varieties; four types of Corner Beads; three types of Base Screeds, etc. Send for free Hy-Rib Hand Book.

**TRUSCON STEEL COMPANY,** Youngstown, Ohio

*Representatives in Principal Cities*

**For Concrete Roads**

Kahn Road Mesh
The most efficient reinforcement for concrete roads and pavements.

Kahn Curb Bars
Protect and reinforce concrete curbs.

Kahn Armor Plates
Perfectly protect expansion joints.

Write for Highway Pamphlet and estimates.

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THE size and capacity of the large sand and gravel crushing and washing plant of the Akron Gravel and Stone Co., Akron, Ohio, illustrated above, exceed any other land operated plant so far constructed. The daily 10-hour capacity is 100 cars of crushed and washed material. This modern, electrically operated plant is equipped with a 48-inch Symons Disc Crusher.

Equip **your** plant with a Symons Disc Crusher. It will increase your output, lower your cost and deliver a more uniform material. The Symons Crusher is unexcelled for secondary crushing or to replace Gyratory crushers up to No. 7 1/2. It is also economical in plants where the feed is not over 6 1/2 for use as an initial breaker.

Records made by the Symons Disc Crusher in plants of large gravel producers attest their superiority for low maintenance and operating expense. They are made in four sizes.

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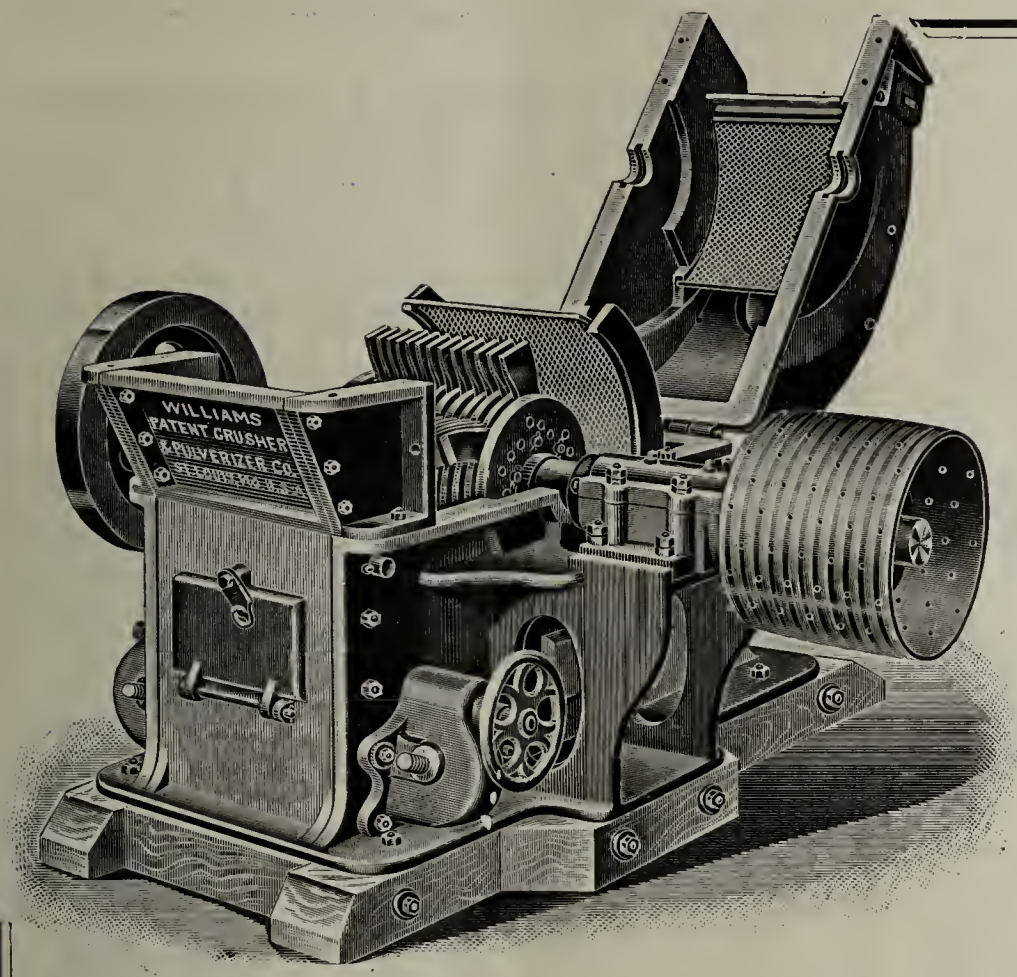
**CHICAGO HEIGHTS, ILLINOIS**

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# LIMESTONE GRINDERS

**Take 2 in. to 3 in. dry stone and in one operation, without outside screens or separators will produce 95% through 20-mesh material.**

**CAPACITIES RANGE FROM ¼ TO 30 TONS PER HOUR**

**Over 5,000 Williams Mills in Daily Operation.**

There is undoubtedly room in your plant for one of these machines, which, in the last twenty-two years have proven that they are money savers, can be depended on, and really have merit. If further information is desired, Write for Bulletin No. 17, which is brim full.

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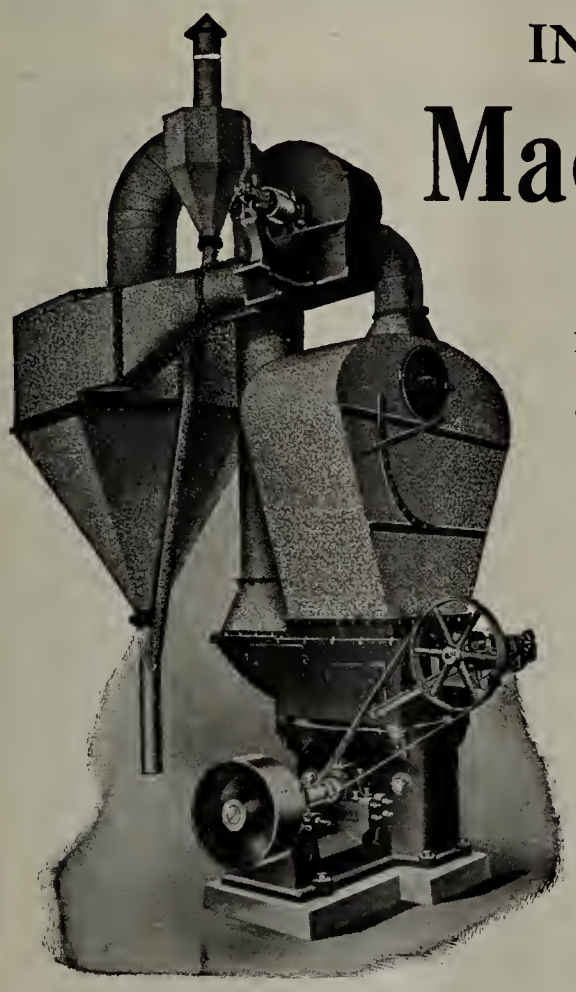
**SAN FRANCISCO**

# Complete Grinding
IN ONE
# Machine



**In successful use grinding Cement, Clinker, Limestone, Coal**

**INSTANT REGULATION OF FINENESS**

**NO DUST**

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**CANTON, OHIO**

# Big Profits

## Making Vaults

Easy to make, and easy to sell.

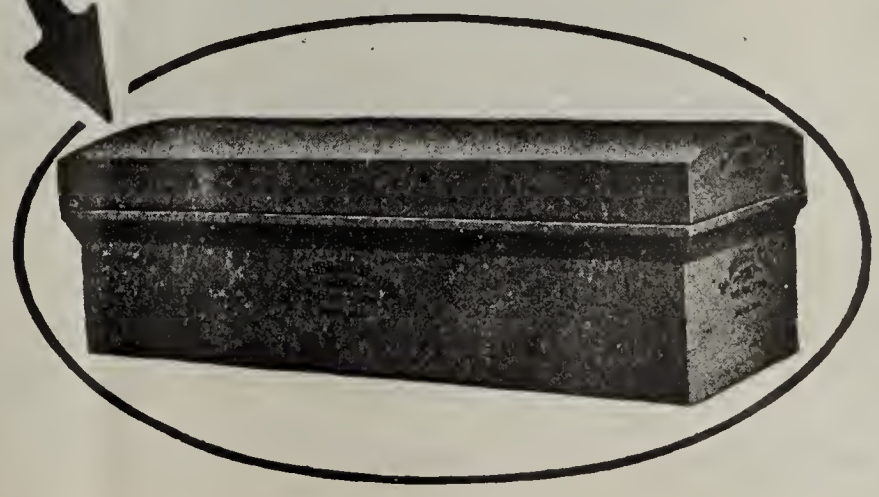
Automatic Sealing Vaults assure big profits and steady work.

You can make these vaults in your spare time, or start a business of your own. The only equipment necessary is a set of our Adjustable Steel Molds.

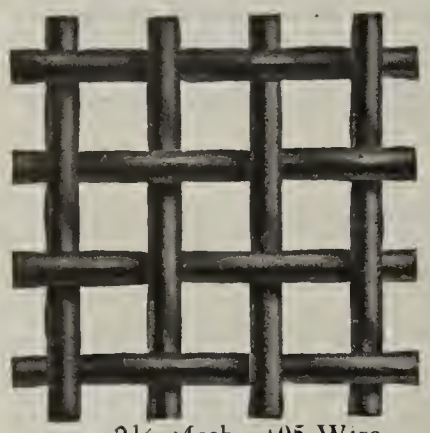
The Automatic Sealing Vault automatically seals itself when the cover is put on; and protects a burial casket forever against water, vermin, and decay. It is cheap enough for everyone and appeals to everyone.

Write for full information.

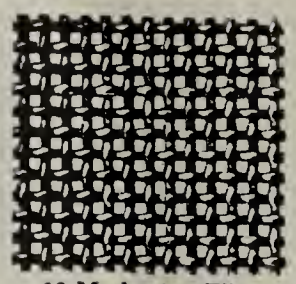
## The Automatic Sealing Vault Company
**216 E. River St.** **Peru, Indiana**



## Cleveland Double-Crimped
# WIRE CLOTH



2½ Mesh; .105 Wire



1½ Mesh; .047 Wire

Renowned for its Uniformity, its Superior weave, its Durability. Especially adapted for SAND, GRAVEL and CEMENT Screens. A large stock of the various meshes always on hand.

***Price Right—Catalog on Request***

**THE CLEVELAND WIRE CLOTH & MFG. CO.**
**3575-83 E. 78th Street, CLEVELAND, OHIO**

# In Tune With Conditions

The live topic on the use of concrete today is the application of that material to shipbuilding.

America has taken hold of the concrete ship in a big way. This means greater need than ever for cement.

## VULCAN KILNS

are doing a major share in supplying the tremendously growing demand. They are the most widely used kilns in America. Every detail in their design and construction calls for the mechanical judgment of specially trained engineers. These same engineers are ready and willing to assist and advise you.

If you use or can use kilns you need "Vulcans." Write for our booklet on kilns today. We will also send a list of some of the users in your locality.

## VULCAN IRON WORKS
1740 Main St., Wilkes Barre, Pennsylvania

# *"That's What I Have Been Looking For"*

## A One-Man Car Unloader

*For Crushed Stone, Sand, Gravel, Slag, Ashes, Etc.—*

### The Sunbury Automatic Car Unloader

30 Foot Steel Continuous Bucket Elevator, 25 ton Wooden Center Discharge, Portable Bin, 8 H. P. Gasoline Engine, Coupled to the Sunbury Automatic Feeder, which is installed under track carrying the material to the elevator, is the combination that has made a cost of *50 cents per car* for unloading, easily obtained.

***Catalog will be sent on request***

MANUFACTURED BY

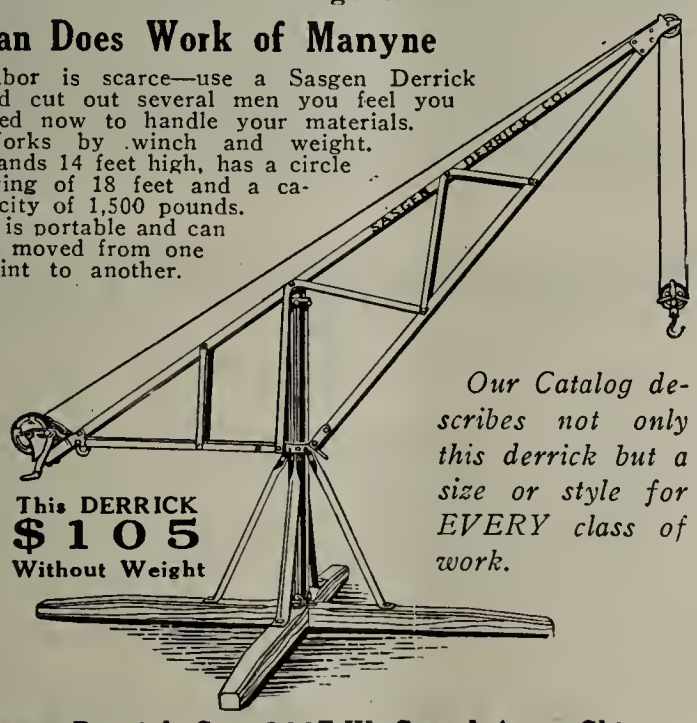
## The Sunbury Manufacturing Company
**Sunbury, Ohio**

# Load and Unload
## With a Sasgen Portable Derrick

The Sasgen Circle Swing Counterweight Derrick cuts costs, labor and time loading or unloading material from cars or wagons.

### Oan Does Work of Manyne

Labor is scarce—use a Sasgen Derrick and cut out several men you feel you need now to handle your materials. Works by winch and weight. Stands 14 feet high, has a circle swing of 18 feet and a capacity of 1,500 pounds. It is portable and can be moved from one point to another.




This DERRICK
**$105**
Without Weight

*Our Catalog describes not only this derrick but a size or style for EVERY class of work.*

**Sasgen Derrick Co., 3117 W. Grand Ave., Chicago**

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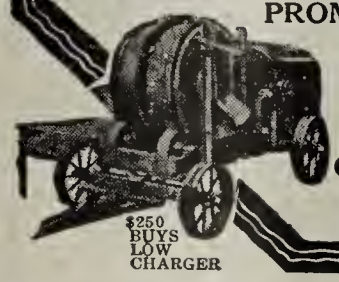
Pavers, Grouters, Hoists, Pumps,

**BOSS** HIGH SPEED

Building Mixers, Backfillers, Elevators

## Contractors' Equipment
BUILT OF STEEL WITH HYATT ROLLER BEARINGS

ASK ABOUT OUR HIGH DRUM TWO BAG PAVER



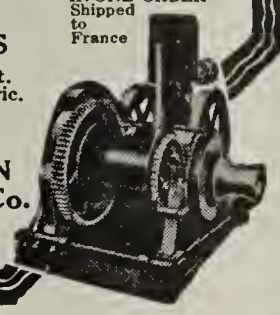
$250 BUYS LOW CHARGER

Astonishingly Low Prices
--Cash or Terms--
PROMPT DELIVERIES

All sizes from 5 ft. to 22 ft. cap., Gas, Steam or Electric. Complete stock carried in or near your city.

THE AMERICAN Cement Machine Co. Inc.
Keokuk, Iowa

OVER 100 SOLD IN ONE ORDER Shipped to France



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**CALDWELL'S HELICOID**

HELICOID Screw Conveyor is heavier, stronger and better made than any other. Requires fewer repairs —no lapped and riveted joints to come apart—flight all one piece. Special hangers, bearings and boxes for cement work. If you have anything to do with the manufacture of cement, you should write for our Catalogue.

Elevating, Conveying and Power Transmitting Machinery.

## H. W. CALDWELL & SON CO.
17th Street and Western Ave., CHICAGO

NEW YORK, Fulton Bldg., Hudson Terminal, 50 Church St.
DALLAS, TEXAS, 711 Main St.

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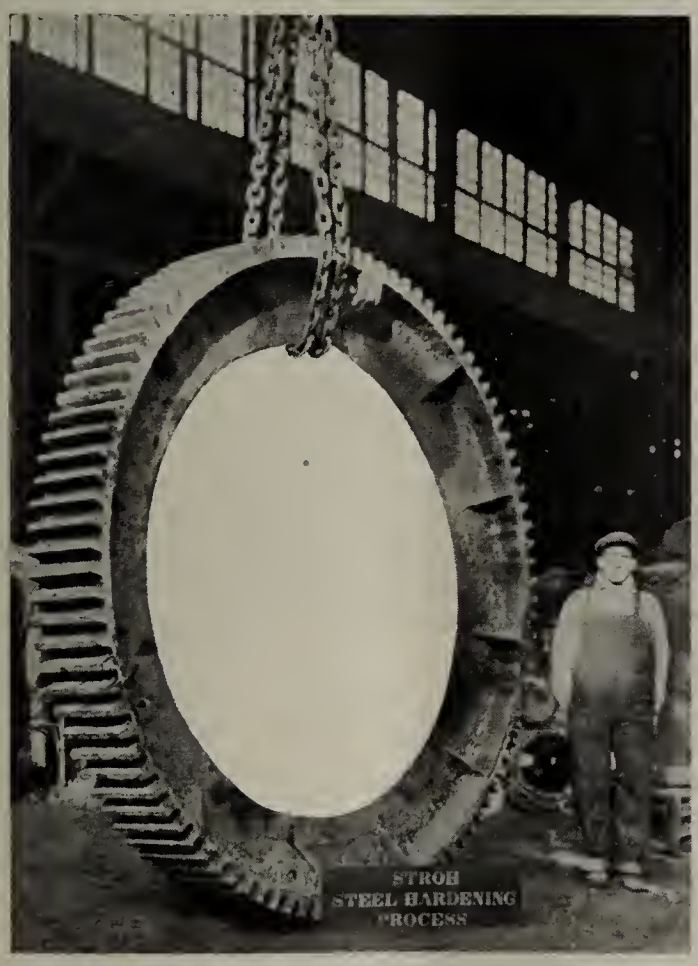
# STROH STEEL CASTINGS



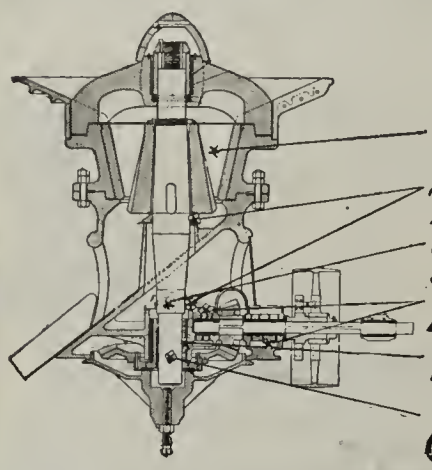

BY THE STROH PROCESS the wearing surface of each casting is made of Stroh Alloy, the hardest known material for this purpose, backed up by carbon steel of lower cost for resilience, ease of machining and economy. Stroh Process castings that receive abrasion in the cement mill are lower in final cost than any other castings, and by reason of this are in use in over 85 per cent of the American and Canadian mills.

May we send you our booklet telling of the Stroh Process and its achievements? You will find it intensely interesting and, we believe, profitable also.

## STROH
## STEEL HARDENING PROCESS CO.
**Pittsburgh, Pa.**

F. LLOYD MARK, Western Sales Manager, Monadnock Bldg., CHICAGO

# AUSTIN
## GYRATORY CRUSHERS



### *Six Special Advantages*

1. After adjusting for wear of head concaves will receive the same sized rock.
2. Upper and lower collars thoroughly protect working parts from dust and grit.
3. Automatic oil-pump and oiling system, insuring thorough lubrication of all bearing surfaces.
4. Countershaft supported on both sides of driving pinion.
5. Rigid eccentric bearing.
6. Full eccentric bearing surface retained when head is raised.

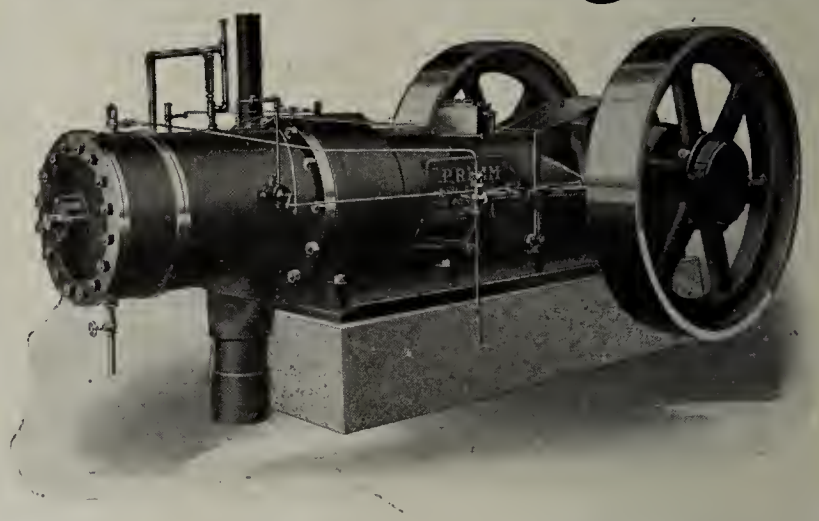
***Made in Eight Sizes—50 to 5,000 Tons Per Day***

We sell Austin Gyratory Crushers on their mechanical superiority evidenced by the users. Amongst recent purchasers are the United States Government, Australian Government, etc. Austin Crushers have been identified with some of the most important engineering projects, such as the Mississippi Dam, etc.

Present your crushing problems to us for advice and estimate.

**Austin Manufacturing Company**
**CHICAGO**
**New York Office: 50 Church Street**

# Primm Oil Engines



## The Any-Purpose Oil Engine

Can be used in any method of power transmission.
Burns the widest range of fuel—crude oil or any of its by-products.
Starts automatically.
Amply guaranteed in regard to material and workmanship.

A size and type for every need illustrated in our catalog. Visit our big modern plant.

**THE POWER MFG. CO.** Dept. 4
**MARION, O.**

## DU PONT AMERICAN INDUSTRIES

# Don't Waste Explosives!

Tamp each charge thoroughly to confine the full force of the blast and use the explosive particularly designed for your kind of blasting operation.

One means of conserving is to use Red Cross Explosives. Another economy is to

## Fire Charges Electrically

There is no reason for using dynamite of 40% or 60% strength when the same or better results can be accomplished with a grade of less strength.

And electric firing with dependable Du Pont blasting machines and electric blasting caps, is surer and safer.

Our High Explosive Booklet and our Blasting Supplies Catalog will advise what will best serve you. The coupon will bring you free copies.

Note: When in Atlantic City, visit Du Pont Products Store, Boardwalk and Penna. Ave., and the Shooting School on Ocean End of Young's Million Dollar Pier.

**E. I. du Pont de Nemours & Co.**
**Powder Makers Since 1802 Wilmington, Delaware**

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The Arlington Works, 725 Broadway, New York, Ivory Py-ra-lin and Cleanable Collars.
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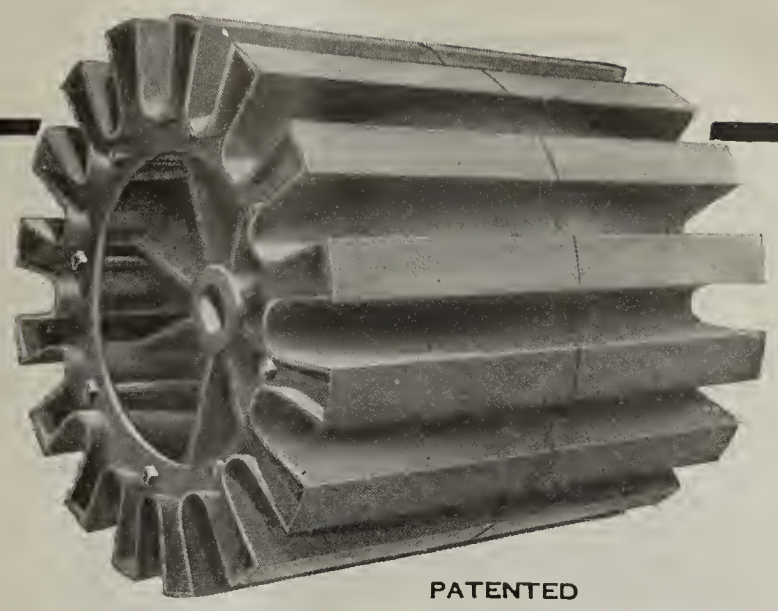
DU PONT

# THE "BLACK" ELEVATOR BOOT PULLEY



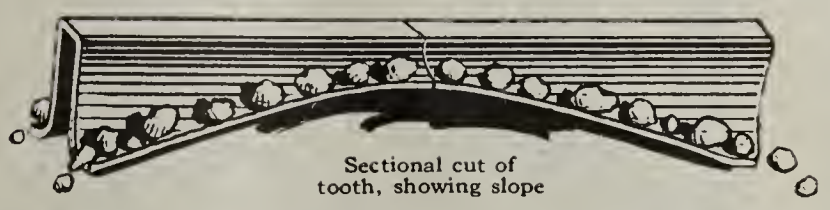
PATENTED

You have wanted this pulley for a long time; you need it now—and here it is—simple as can be and yet giving the *results* that spell economy to you.

Shut-downs in crusher plants are frequently caused by time required in replacing elevator belts that have been cut to pieces by the action of stones which fall between the belt and boot pulley.

The "BLACK" BOOT PULLEY eliminates such trouble. Look at the illustration. The longitudinal grooves—shallow at center of pulley, slope rapidly to the sides (about 3 inches to the foot) so that anything falling between the teeth or being caught between belt and pulley is instantly rejected.

SAVE YOUR ELEVATOR BELTS!



Sectional cut of tooth, showing slope

Manufactured exclusively by us. Made in standard sizes (18"x12" to 32"x44") for standard Gates Elevators and in various other sizes for other types of elevators. Write for information.

**ALLIS-CHALMERS MFG. Co**
**MILWAUKEE, WIS.**

## CRUSH YOUR STONE and GRAVEL

The Ideal Crusher for the Concrete Product Plants, Gravel and Crushed Stone Producer

The World's Famous Universal Crusher

***We Build Crushers from 5 Tons to 300 Tons per 10-hour Capacity***

Instantly adjusted to produce size required from ¼ inch to 3 inches. *Write for Folder No. 14.*

**UNIVERSAL CRUSHER COMPANY**

**230 Bee Ave** **Cedar Rapids, Iowa, U. S. A.**

# The *American* Dust Filtering Process

eliminates dust and collects and saves it; thus, saving your men, money and machinery, and increases efficiency of all departments of your plant.

## *The American Suction Filter*

can be used both on raw and finishing grinding on kilns for the recovery of dust and potash. *Write for particulars and data.*

**READ WHAT THEY SAY ABOUT IT**

**SOUTHWESTERN PORTLAND CEMENT COMPANY**
**Los Angeles, California**

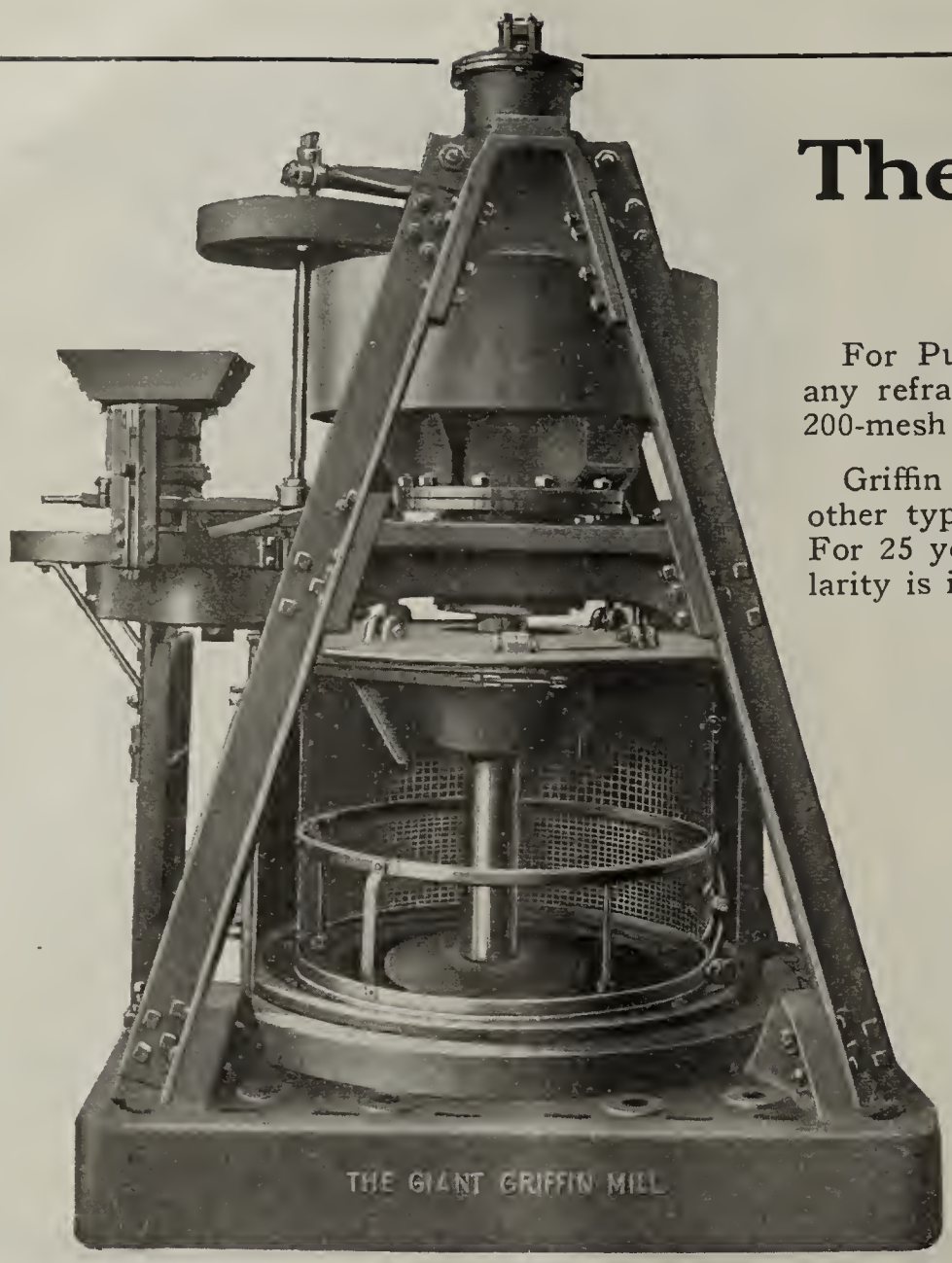
Mr. W. G. Clark, Victorville, Calif.
Care Clark Dust Collecting Co., Saturday, Dec. 29th, 1917.
Fisher Bldg., Chicago, Ill.

My Dear Mr. Clark:—

I have your letter of December 22nd, and in reply will say that we have your Dust Collector working in our Packing Department and is taking care of all the dust around the packing machines. The Collector is plugging away every day and is giving excellent results. So far we have had no trouble or repair work on the installation, and it is collecting all the dust around the packing machines, as you know these machines create a great amount of dust.

Yours truly, L. D. GILBERT, Supt.

**THE CLARK DUST COLLECTING COMPANY**
**Dust Collecting Engineers**
**FISHER BUILDING** **CHICAGO, ILLINOIS**




# The Improved Giant Griffin Mill

For Pulverizing Coal-Cement Clinker, Raw Material or any refractory material where a finess of 83% through a 200-mesh screen is required.

Griffin Mills are used by Cement Plants more than any other type of pulverizer. Now in operation in 45 plants. For 25 years they have led the procession and their popularity is increasing.

Recent improvements have reduced their former low H. P. and Maintenance Cost to the Minimum. Why not investigate this new Griffin Mill?

Recommended for Agricultural Limestone Producers as well as Cement Producers.

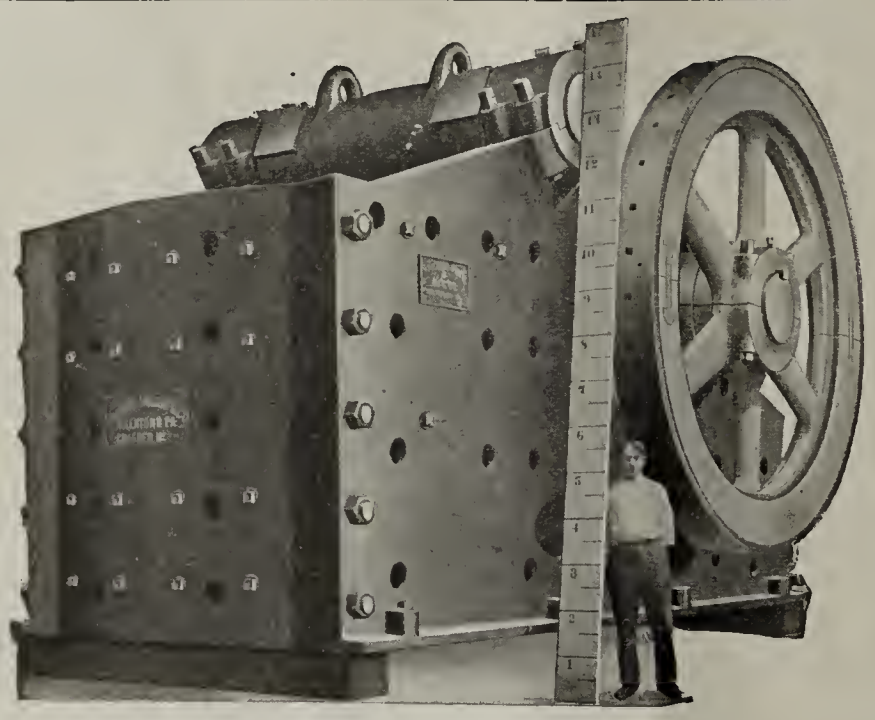
GRINDS ANY DRIED REFRACTORY MATERIAL.

Our Engineers Are at Your Disposal.

## Bradley Pulverizer Co.

**Works Allentown, Pa.**

**BOSTON** **LONDON**



**Tray or 60"x86" All Steel Jaw Crusher**

## TRAYLOR JAW CRUSHERS

**Are Built in All Sizes from 7″x10″ to 66″x86″**

The 66"x86" is the largest crusher built.
All Traylor Jaw Crushers have cast steel water cooled pitmans.
Extra size pitman and swing jaw shafts of finest hammered steel.
Chrome steel toggle seats.
Manganese steel or chilled iron jaw plates.

# TRAYLOR BUILT MACHINERY

## A CRUSHER FOR EVERY PURPOSE

***We Make***

In addition to **JAW CRUSHERS** illustrated

**The Traylor Gyratory Crusher**
The last word in Gyratorys.

**The Traylor Crushing Rolls**
They eliminate the personal equation in automatically preventing tire corrugations.

**The Traylor Tube Mills**
Long or short for wet or dry grinding. Have water cooled bearings of extra size. Positive automatic feed that assures maximum tonnage for minimum horse power.

**The Traylor Ball Tube Mill**
For reducing lumps to fines in one step.

## "THE ULTIMATE CRUSHING EQUIPMENT"

## TRAYLOR ENGINEERING & MANUFACTURING COMPANY

**MAIN OFFICE AND WORKS: ALLENTOWN, PA., U. S. A.**

**New York Office: 30 Church St.** **Western Office: Salt Lake City**

# Cement and Engineering News

Vol. 30 September, 1918 No. 9

New Type of Concrete Coal Pocket Divided Into Eight Compartments with 8 Loading Chutes, Where the Motor Truck Can Either Back or Drive Alongside and Receive Its Load. This Octagonal Shaped Pocket Was Designed and Patented by Michael Lynch, a Coal Dealer in Paterson, N. J.

# Editorial

## The Housing Problem as a Part of War Work

Among the essential things for the winning of the war is house building for the adequate and comfortable accommodations of workmen.

We do not believe that any man of wealth, regardless of how great his wealth may be, has any right at the present time to build a costly dwelling. But we do believe that thousands and tens of thousands of thoroughly comfortable, inexpensive dwellings should be built to meet the housing problem throughout the country. We do not mean cheap shacks, for we do not believe that workmen of any kind, farm laborers, day laborers, or mechanics, should be housed in cheap shacks, nor do we believe that it is for the best interests of the nation to crowd men together in such close quarters as to make it impossible for them to do the very best work and to become thoroughly contented, vigorous workers.

Whatever lessens the physical and mental stamina of a man lessens his efficiency for work. It has been taken for granted by some of our people that where there is so much to do in the way of shipbuilding and munition production, housing accommodations should be of a purely temporary character and that the men and materials needed for more permanent structures should not be used. We believe this takes an erroneous view of the situation.

Good houses with modern comforts and conveniences, simple and plain perhaps they may be in some respects, but thoroughly comfortable and adequate for the needs of the working people, must be built if we are to develop the highest efficiency on the part of shipworkers, iron and steel makers, and all others engaged in producing war materials.

We heartily endorse the statement recently issued by Mr. Noble Foster Hoggson of New York, in the course of which he said:

"In war times all problems are the 'most important.' It depends upon what is being agitated at any particular time—ships, munitions, airplanes, men, money, etc. Six months ago it was the housing of workmen. Men were sleeping 15 and 20 in a room, sleeping in three shifts, one man, waiting his turn, routing another out of bed when his eight hours were up. Industrial housing was the question of the hour, the paramount issue, the most important problem.

"We do not hear so much about houses for workers today. Is it because the condition has been met? Because the houses had been provided? Not at all! It merely means that we agitated the housing proposition until we found something new to start an agitation about.

"Read the technical building journals; scan the various building reports. There is hardly a section that is not clamoring for housing accommodations. In Maine they fear a tent city will have to house part of its new population this coming winter. Every munition center, shipyard locality, industrial town, is almost as bad off in housing facilities as it was months ago. In Kansas, where one would little dream of expanding cities at this time, there is an acute shortage of housing. New oil discoveries have created new towns and boomed old ones.

"Of course, the problem will be solved, houses will be provided. But the great danger in the delay lies in this: The situation will become so desperate that any kind of shelter provided will be welcome. In other words, on the plea of expediency, there is a great danger of temporary shack construction being thrown up, and the dreams and plans for a constructive housing scheme along permanent lines will fall far short of realization.

"The Bureau of Industrial Housing and Transportation of the Department of Labor some months ago, in consultation with Lawrence Veiller, secretary of the National Housing Association, and assisted by a number of notable architects and city planners, adopted a set of standards which is recommended for permanent industrial housing developments. These standards were well conceived and far-seeing. If followed, they would establish housing enterprises on an encouraging basis.

"But, no less than in the days at Valley Forge, 'these are times that try men's souls,' and as the necessity for housing grows more and more acute, the temptation to throw up temporary structures, even temporary settlements, will be difficult to resist.

"Witness this item from the Emergency Fleet News of July 1:

" 'Although steps are under way to erect about 1600 homes in Wilmington, the housing situation there, on account of the influx of shipyard and other workers, is so acute that it is proposed to have the City Council lift the ban on frame dwellings, so that ready-made shelters may be erected temporarily. Official moving day in Wilmington is June 25. Many families have been notified to move on that day, and have no place to go. Many complaints have been made of the high rents charged.'

"The best way to promote the growth of Bolshevikism in this country is through maintaining a low standard of living, of continuing to force three men to occupy the same bed in eight-hour shifts, of herding 20 men and more into one room for sleeping quarters.

"The solution to a problem of social unrest is through the ministration of social justice. The average worker (the majority) seeks nothing more than a condition of contentment—a family, a decent living wage, a place in the community, the full rights of citizenship. These may be all summed up in 'home.'

"Housing is not only an immediate problem, it will be one of the big after-the-war problems. Now is the time to solve it, not only for the present, but for the future. We must build real homes, establish real communities, permanent homes and permanent communities. We must do it now, and do it right, before it may be too late."

---

## Time Ripe to Push Concrete Coal Pockets

Coal dealers have gone through a sweat this season, due to car shortage, coal shortage, labor shortage and high prices of everything. The dealers without storage bins wish they had some. The dealers without labor wish they had automatic gravity coal pockets which would make them independent of labor conditions.

The railroads and Interstate Commerce Commission are co-operating to keep cars moving by boosting demurrage charges to a point where three or four days' delay will hurt. Hundreds of dealers have had big demurrage charges this year simply because it was impossible to get them to unload the cars.

The dealer who has plenty of bin room can buy his coal and store it early in the spring and can afford to hold it till the prices advance in the fall.

Silo building equipment is just what is needed for putting up coal pockets. The walls have the same thickness and the construction is the same but for changes in the reinforcing. There's no time like the present to make this proposition forcible to the coal dealers. Remember, too, that the building should be completed early in the summer, so it is wise to get these jobs lined up now. Strike while the iron is hot.

There has never been a time for many years when coal dealers have been so pressed for coal as during the present season. Those dealers who have carried large stocks are fortunate and are being well paid for having additional storage facilities.

The elevated automatic coal handling plant makes the dealer independent of labor conditions, saves from 30 to 35 cents a ton on all the coal handled and makes possible the most economical buying on account of the storage facilities of the plant.

## "A Welcome Change"

The Philadelphia Record recently had a most timely editorial under the above head, showing a number of reasons why concrete is a good thing to use on public improvement.

The great trouble is that the men who need most to read such things and to profit by the lesson, very seldom get them. In the hope, however, that it will get across to a few of them, we reprint it herewith:

"In these days of higher prices for practically everything it is a pleasing variation to read that by substituting concrete for steel in the elevation of the railroad tracks in the South Philadelphia improvement there will be a saving of $800,000 for the city and companies interested. Not only is this amount well worth saving, but the change will make it possible to secure more sightly structures than those that had been planned of steel. This is well illustrated in the case of the bridge carrying the Philadelphia & Reading Railway over Spring Garden street near Ninth. The old structure was a hideous affair, without one redeeming feature. The concrete arches that have replaced it are attractive to the eye and vastly more durable. The design selected for the track elevation on Washington avenue and other downtown streets seems to offer great possibilities in the way of combining ornament and utility. As it is to be carried over Broad street, where it will be viewed by many thousands of persons daily, this question of ornament is by no means an unimportant one. There is a fine opportunity here for the Art Jury to see that the city's interests are well guarded by demanding a structure that shall be graceful and pleasing in design, while fully meeting all the traffic requirements of the railroads.

In comparison with some other municipal undertakings, notably the Broad street subway, the Art Museum and the Free Library, the South Philadelphia improvement, though planned on a scale calling for an expenditure of $30,000,000 and involving an almost entire reconstruction of the railroad trackage and the pier system in the lower part of the city, attracts relatively little attenion. It has now been quietly under way for two or three years, and is making steady progress. Its completion, which will be materially hastened by the substitution of concrete for steel in much of the work, should give a big impetus to the development of South Philadelphia. This has already begun, but will be greatly facilitated by the removal of the grade crossings which now delay travel and have done so much to depress realty values.

## Be Prepared

We believe it is one of our advertisers who has made the statement that "the mixer is the heart of any piece of concrete construction."

That is not merely an advertising talk, either. Anyone will see the logic of the statement if he considers for a moment that practically all operations must stop if the mixer breaks down, just as all the bodily functions must stop, if the heart ceases to beat.

The simile cannot be carried too far, however; for while a human being cannot have two hearts, so that one can be brought into operation when the other becomes disordered, a man may, and the wise ones do, have two mixers, one of them standing around ready for emergency, believing that an idle mixer is not as great an expense as a bunch of men made idle the moment that concrete ceases to flow.

A few days ago we saw a mixer standing idle in a concrete products plant, ready to be brought into action the moment that there might be a breakdown of the main equipment. This looked to us like good business; for have we not seen many times almost the entire force of a plant standing around with their hands in their pockets waiting for the mixer to mix? We remember, too, that the contractor who has made the most rapid and consistent progress on the concrete road work in Vermillion County, Illinois, has an emergency mixer constantly standing at the side of the road ready to be brought into play if an accident should happen.

Some people who are willing to take chances say that having an emergency machine on hand is simply one way of courting trouble. But we notice that the men who are willing to invest this extra amount of money are prospering amazingly.

## Too Much Water Makes Weak Concrete

Clean aggregates. Proper proportions. Thorough mixing. These points have been discussed so thoroughly that every concrete worker knows their importance in producing satisfactory concrete.

Recent experiments show that great care exercised in selecting materials, proportioning and mixing will be entirely lost if the concrete is mixed with an excessive amount of water. This is true under all conditions of concrete making; lean or rich mixtures, fine or coarse aggregate, hot or cold weather.

For example, concrete mixed with 7½ gallons of water, per sack of cement, gave a strength of 2,100 pounds per square inch, at 28 days, while the same mixture with 6 gallons of water per sack of cement, gave a strength of 3,000 pounds per square inch at 28 days. These results demonstrate that the minimum amount of water should be used, with which a workable mix may be secured.

Contractors and products manufacturers should not interpret this to mean that real dry tamped concrete

gives the best results. There is just as much reduction in strength due to using too little water as too much. A concrete which will settle slightly when shoveled into a pile, but not flow, is desirable.

## Concrete Cuts High Cost of Building

The railroads, also, are systematically planning to use concrete with a view to cutting down the high cost of building. Its use for this purpose by the city of Philadelphia is noted on another page. The railroad end of the story is told in a clipping from the Kansas City Post:

"To fight the rising cost of steel, the railroads of the southwest are backing the erection of a $100,000 plant in Kansas City, Kas., to manufacture reinforced concrete parts for building bridges and culverts.

"Two similar plants will be operated, one in Texas and the other in California.

"The Kansas City plant will be operated by the Railway Cement Products Company, a Kansas corporation. It has been designed to produce reinforced concrete piles, girders, floor slabs, drain pipes and boxes. The plant will operate in the winter months with a system of compressed steam by which concrete can be cast as nearly perfect as in warmer weather. It will be in operation about February 15.

"From 50 to 100 men will be given employment in the new plant when it opens, and it is expected that eventually 200 to 300 will be employed.

"The decision to adopt concrete instead of steel in the building of bridges, trestles and culverts is based on a saving of both time and money. The railroads figure that the use of concrete parts will enable them to save 40 per cent of their annual outlay for bridge steel.

"For the Santa Fe system alone, this will mean an annual gain in net income of $500,000 to $800,000. In addition to this saving in initial expense, the use of concrete eliminates the heavy cost of maintenance necessary to prevent deterioration of steel. The life of steel bridges is from 20 to 25 years, while engineers figure that concrete bridges will last indefinitely.

"It now requires practically 18 months for the filling of structural steel orders. The concrete bridge parts, which will be cast according to standards adopted by the railroads entering into the project, can be had immediately after the order is placed.

"The system of casting all bridge parts in sections according to adopted standards will also eliminate the heay cost of special forms for each bridge."

## News Items

The concrete road that is under construction between Webb City, Mo., and the Kansas state line has progressed sufficiently that work of concreting the road is well under way. New machinery, a large two-yard "Boss" high-speed mixer, which was purchased by the contractors, Myers & O'Day, has laid over 520 feet of concrete.

The contractors expect to start laying from 500 to 800 feet of concrete each day, beginning Monday, until the construction of the road is completed.

The Atlas Portland Cement Company of Northampton, Pa., cut up more than fifty acres of its field into small plats and put them at use of employes for war gardens.

The contract to furnish cement to the Dallas, Texas, street department for the ensuing year was awarded to the Texas Cement Company, the bid being $2.33 per barrel, with a refund of 10c each for returned sacks. The Trinity Cement Company bid $2.43 per barrel.

## Cement in 1917

### Advance Statement of Final Figures

Statistics of the cement industry in the United States in 1917 prepared under the direction of Ernest F. Burchard, of the United States Geological Survey, Department of the Interior, indicate that the total shipments of Portland cement from the mills amounted to 90,703,474 barrels, valued in bulk at the mills at $122,775,088. This represents a decrease in quantity of 4.1 per cent and an increase in value of 17.8 per cent compared with 1916. The combined shipments of natural and puzzolan cements in 1917 were 639,456 barrels, valued at $435,370, representing a decrease in quantity of 24.1 per cent and an increase in value of 1.0 per cent compared with 1916. The production of Portland cement in 1917 was 92,814,202 barrels, compared with 91,521,198 barrels in 1916, an increase of 1.4 per cent. This production holds the record, the next highest output, 92,097,131 barrels, having been made in 1913.

Not only was the largest output of Portland cement made in 1917 but the factory price received during the year throughout the country was high, ranging from $1.22 per barrel in the Lehigh district to $1.69 in the State of Washington, and averaging for the whole country $1.354, as compared with $1.103 in 1916.

The exports of hydraulic cement from the United States in 1917 were 2,586,215 barrels, valued at $5,328,536, or $2.06 per barrel, compared with 2,563,976 barrels, valued at $3,828,231, or $1.49 per barrel in 1916. The imports for consumption in 1917 were 2,323 barrels, compared with 1,836 barrels in 1916. The statistics of exports and imports were compiled from records of the Bureau of Foreign and Domestic Commerce, Department of Commerce.

In its canvass for cement statistics the United States Geological Survey had the cooperation of the Geological Survey of Alabama, Georgia, Illinois, Iowa, Maryland, Michigan, Minnesota, Missouri, New Jersey, New York, Oregon, Pennsylvania, Virginia and Washington.

The accompanying two tables, which were compiled from reports received from all mills in the United States, show the shipments, their value, the production, and the stocks of Portland cement for 1916 and 1917, by districts and by the principal producing States.

**Production of Portland Cement by Commercial Districts, 1916 and 1917**

| | 1916 (barrels) | 1917 (barrels) | Per centage of change 1917 | Average factory price per barrel 1917 | Per centage of change 1917 |
|---|---|---|---|---|---|
| Lehigh district (Eastern Pennsylvania and Western New Jersey)— | | | | | |
| Shipments | 25,360,287 | 24,423,641 | — 3.7 | $1.220 | +29.2 |
| Production | 24,105,381 | 24,423,507 | + 1.3 | ..... | ..... |
| Stock | 2,155,674 | 2,163,395 | + 0.4 | ..... | ..... |
| New York State— | | | | | |
| Shipments | 5,603,477 | 5,408,726 | — 3.5 | 1.304 | +27.0 |
| Production | 5,643,677 | 5,417,530 | — 4.0 | ..... | ..... |
| Stock | 798,207 | 808,328 | + 1.3 | ..... | ..... |
| Ohio and Western Pennsylvania— | | | | | |
| Shipments | 8,123,492 | 7,248,264 | —10.8 | 1,382 | +24.2 |
| Production | 7,936,731 | 7,345,416 | — 7.5 | ..... | ..... |
| Stock | 552,903 | 616,244 | +11.5 | .... | ..... |
| Michigan and Northeastern Indiana— | | | | | |
| Shipments | 5,747,113 | 4,835,304 | —15.9 | 1.427 | +22.2 |
| Production | 5,521,876 | 5,263,810 | — 4.7 | ..... | ..... |
| Stock | 453,282 | 882,421 | +94.7 | ..... | ..... |
| Southern Indiana and Kentucky— | | | | | |
| Shipments | 3,266,215 | 2,386,347 | —26.9 | 1.352 | +22.2 |
| Production | 3,338,942 | 2,517,257 | —22.3 | ..... | ..... |
| Stock | 477,232 | 611,199 | +28.1 | ..... | ..... |

| | | | | | |
|---|---|---|---|---|---|
| Illinois and Northwestern Indiana— | | | | | |
| Shipments | 10,637,659 | 10,233,233 | — 3.8 | 1.367 | +29.5 |
| Production | 10,360,563 | 10,927,990 | + 5.5 | ..... | ..... |
| Stock | 1,193,341 | 1,889,763 | +58.4 | ..... | ..... |
| Maryland, Virginia and West Virginia— | | | | | |
| Shipments | 3,315,323 | 3,109,098 | — 6.2 | 1.265 | +25.4 |
| Production | 3,189,585 | 3,122,936 | — 2.1 | ..... | ..... |
| Stock | 256,093 | 305,948 | +19.5 | ..... | ..... |
| Tennessee, Alabama and Georgia— | | | | | |
| Shipments | 3,541,572 | 3,686,359 | + 4.1 | 1.233 | +25.8 |
| Production | 3,502,259 | 3,676,354 | + 5.0 | ..... | ..... |
| Stock | 237,385 | 220,582 | — 7.1 | ..... | ..... |
| Iowa, Missouri and Minnesota— | | | | | |
| Shipments | 11,178,790 | 11,510,753 | + 3.0 | 1.485 | +25.1 |
| Production | 10,592,234 | 11,774,381 | +11.2 | ..... | ..... |
| Stock | 860,001 | 1,123,654 | +30.7 | ..... | ..... |
| Nebraska[a], Kansas, Oklahoma and Central Texas— | | | | | |
| Shipments | 7,735,418 | 7,405,415 | — 4.3 | 1.453 | +24.4 |
| Production | 7,502,111 | 7,710,365 | + 2.8 | ..... | ..... |
| Stock | 392,277 | 686,390 | +75.0 | ..... | ..... |
| Rocky Mountain States (Colorado, Utah, Montana and Western Texas)— | | | | | |
| Shipments | 3,141,855 | 3,197,284 | + 1.8 | 1.664 | + 9.0 |
| Production | 3,097,385 | 3,261,675 | + 5.3 | ..... | ..... |
| Stock | 197,084 | 263,063 | +33.5 | ..... | ..... |
| Pacific Coast States (California, Washington and Oregon)— | | | | | |
| Shipments | 6,901,095 | 7,259,050 | + 5.2 | 1.399 | — 4.0 |
| Production | 6,830,454 | 7,372,981 | + 7.9 | ..... | ..... |
| Stock | 787,063 | 891,895 | +13.3 | ..... | ..... |
| TOTAL— | | | | | |
| Shipments | 94,552,296 | 90,703,474 | — 4.1 | 1.354 | +22.8 |
| Production | 91,521,198 | 92,814,202 | + 1.4 | ..... | ..... |
| Stock | 8,360,552 | 10,462,882 | +25.1 | ..... | ..... |

[a] No output 1916.

**Production of Portland Cement by States, 1916 and 1917.**

| STATE— | 1916 (barrels) | 1917 (barrels) | Per centage of change 1917 | Average factory price per barrel 1917 | Per centage of change 1917 |
|---|---|---|---|---|---|
| California— | | | | | |
| Shipments | 5,216,324 | 5,659,547 | + 8.5 | $1.312 | — 7.6 |
| Production | 5,332,860 | 5,653,362 | + 6.0 | ..... | ..... |
| Stock | 494,893 | 480,073 | — 3.0 | ..... | ..... |
| Illinois— | | | | | |
| Shipments | 3,562,659 | 4,378,233 | +22.9 | 1.391 | +46.3 |
| Production | 3,642,563 | 4,659,990 | +27.9 | ..... | ..... |
| Stock | 526,341 | 805,763 | +53.1 | ..... | ..... |
| Indiana— | | | | | |
| Shipments | 10,350,105 | 8,148,678 | —21.3 | 1.360 | +22.5 |
| Production | 10,050,433 | 8,705,831 | —13.4 | ..... | ..... |
| Stock | 1,195,891 | 1,760,101 | +47.2 | ..... | ..... |
| Iowa— | | | | | |
| Shipments | 4,853,789 | 4,428,765 | — 8.8 | 1.551 | +22.1 |
| Production | 4,703,213 | 4,626,141 | — 1.6 | ..... | ..... |
| Stock | 428,011 | 618,811 | +44.6 | ..... | ..... |
| Kansas— | | | | | |
| Shipments | 4,298,097 | 3,772,884 | —12.2 | 1.397 | +30.2 |
| Production | 4,212,010 | 4,015,169 | — 4.7 | ..... | ..... |
| Stock | 210,905 | 452,835 | +114.7 | ..... | ..... |
| Michigan— | | | | | |
| Shipments | 5,151,818 | 4,313,771 | —16.3 | 1.419 | +21.5 |
| Production | 4,919,023 | 4,688,899 | — 4.7 | ..... | ..... |
| Stock | 338,035 | 713,796 | +111.2 | ..... | ..... |
| Missouri— | | | | | |
| Shipments | 5,732,001 | 5,800,988 | + 1.2 | 1.422 | +28.7 |
| Production | 5,178,021 | 5,882,240 | +13.6 | ..... | ..... |
| Stock | 314,990 | 403,424 | +28.1 | ..... | ..... |
| New Jersey— | | | | | |
| Shipments | 2,592,302 | 2,397,069 | — 7.5 | 1.236 | +26.4 |
| Production | 2,609,617 | 2,449,876 | — 6.1 | ..... | ..... |
| Stock | 182,661 | 237,554 | +30.1 | ..... | ..... |
| New York— | | | | | |
| Shipments | 5,603,477 | 5,408,726 | — 3.5 | 1.304 | +27.0 |
| Production | 5,643,677 | 5,417,530 | — 4.0 | ..... | ..... |
| Stock | 798,207 | 808,328 | + 1.3 | ..... | ..... |
| Ohio— | | | | | |
| Shipments | 2,142,931 | 1,565,394 | —27.0 | 1.487 | +26.6 |
| Production | 2,109,348 | 1,566,209 | —25.7 | ..... | ..... |
| Stock | 159,834 | 129,838 | —18.8 | ..... | ..... |
| Oklahoma— | | | | | |
| Shipments | 1,712,116 | 1,736,761 | + 1.4 | 1.516 | +18.6 |
| Production | 1,629,899 | 1,772,466 | + 8.7 | ..... | ..... |
| Stock | 45,485 | 70,708 | +55.5 | ..... | ..... |
| Pennsylvania— | | | | | |
| Shipments | 28,748,546 | 27,709,442 | — 3.6 | 1.246 | +28.3 |
| Production | 27,323,147 | 27,752,838 | + 1.6 | ..... | ..... |
| Stock | 2,366,082 | 2,412,247 | + 2.0 | ..... | ..... |
| Texas— | | | | | |
| Shipments | 2,327,659 | 2,358,944 | + 1.3 | 1.552 | +13.7 |
| Production | 2,212,821 | 2,436,398 | +10.1 | ..... | ..... |
| Stock | 144,846 | 222,537 | +53.6 | ..... | ..... |
| Utah— | | | | | |
| Shipments | 892,596 | 899,599 | + 0.8 | 1.625 | — 1.2 |
| Production | 893,533 | 929,730 | + 4.1 | ..... | ..... |
| Stock | 88,105 | 106,590 | +21.0 | ..... | ..... |
| Washington— | | | | | |
| Shipments | 1,575,919 | 1,403,191 | —11.0 | 1.687 | + 8.6 |
| Production | 1,369,485 | 1,513,792 | +10.5 | ..... | ..... |
| Stock | 272,913 | 385,707 | +41.3 | ..... | ..... |
| Other States[a]— | | | | | |
| Shipments | 9,791,957 | 10,721,482 | + 9.5 | 1.369 | +23.6 |
| Production | 9,691,548 | 10,743,731 | +10.9 | ..... | ..... |
| Stock | 793,353 | 854,570 | + 7.7 | ..... | ..... |
| TOTAL— | | | | | |
| Shipments | 94,552,296 | 90,703,474 | — 4.1 | 1.354 | +22.8 |
| Production | 91,521,198 | 92,814,202 | + 1.4 | ..... | ..... |
| Stock | 8,360,552 | 10,462,882 | +25.1 | ..... | ..... |

[a] Alabama, Colorado, Georgia, Kentucky, Maryland, Minnesota, Montana, Oregon, Tennessee, Virginia and West Virginia, in 1916, with Nebraska additional in 1917.

# News Items

The General Cement Products Company, Thomas B. Hall, President, Camden, N. J., recently incorporated, capital stock $100,000.

Assistant Corporation Counsel Brennan of Detroit has given an opinion to the effect that the city council cannot alter the contract under which the Ward Sand & Gravel Company is now supplying the city with sand, so as to grant an increase of 30 cents per ton. Since the contract was made the government has increased freight rates to such an extent that the company claims to be unable to supply gravel at the old rate. The council was willing to grant the rate asked for, but the corporation counsel's office says that the new city charter provides no machinery for the changing of a contract, as asked for in this case.

Effort is to be made at once through the Ohio Sand and Gravel Association to have the sand and gravel producers supplying Ohio put their product through the legitimate dealer just as the cement, plaster, lime, metal lath and other material manufacturers are doing now, says the "Co-operator," organ of the O. B. S. A.

Duluth Cement Products Co., Superior, Wis., recently incorporated by Robt. A. Jones, Ghent R. Smith and H. T. Greenlaw. Capital $25,000.

The Meara Mfg. Co., Mr. S. A. Wells, secretary. Spokane, Wash., a new organization with a capitalization of $100,000, will manufacture concrete building blocks of wet process. The company's plant will be located near Marshall, Wash., where sand and gravel deposits are owned by L. Orliard, general manager and treasurer of the company.

# Hydrated Lime as a Building Material

By C. W. Freitag
Engineer, Pittsburgh, Pa.

To define the product known as "hydrated lime" it should be stated that hydrated lime is a dry, flocculent powder, produced by the slaking of quick lime under standardized factory conditions, and expert supervision. In other words, it bears the same relation to lump lime slaked on the work, as lumber delivered in required dimensions bears to the old practice of hewing the timber, with the broad ax, and sawing it to the proper size at the building site.

### Manufacture of Hydrated Lime

The first steps in the manufacture of hydrated lime are the same as in the manufacture of lump lime. The limestone is quarried and broken to sizes suitable for uniform burning. It is then fed into kilns and heated, or as it is commonly called, burned. The temperature and duration of this process vary according to the chemical and physical characteristics of the stone, and the range of temperature runs from 1,400 to 2,000 degrees Fahr. When in the judgment of the burner all the carbon dioxide has been driven off, the remainder, which is calcium oxide, is taken out of the kiln and allowed to cool on the drying floor. From here it is either put into barrels or shipped in bulk, as quick lime, or preparatory to being hydrated it is placed in a grinder and reduced to pieces about the size of a pea.

The machines used for hydrating lime vary in design and operation; in principle they are either batch or continuous hydrators. While they differ in operating principle, all accomplish the same results, bringing a weighed amount of quick lime into intimate contact with a measured amount of water, in proportion of 56 pounds of lime to 18 pounds of water—sufficient to complete the chemical reaction, but not enough to form a paste.

### Advantages Over Lump Lime

Having gained some understanding of what hydrated lime is, let us consider the justification of its existence and the advantages over lump lime.

1—Hydrated lime leaves the factory completely slaked, all unslaked particles having been removed by screening or air separation.

2—It is ready for instant use upon delivery on the job, eliminating the labor of slaking and time of ageing.

3—It may be stored without danger of fire or deterioration, and therefore without increased insurance rates, or waste due to breakage of barrels and air slaking.

4—It comes in convenient packages of uniform size which makes handling easy and proportioning exact.

Hydrated lime has many applications in agriculture and industry, but since this paper deals with its structural applications, its use only in mortar and concrete shall be treated.

Mortars may be divided into two main classes. To the first class belong mortars which unite the inert materials of which the structure is composed. The second includes mortars which serve as a covering. The first class is represented by brick masonry mortar and concrete; the second by plaster and stucco, though these latter, at times, may be subject to structural consideration.

### Hydrated Lime in Plaster

The properties of old style lump lime plaster are well known. Hydrated lime eliminates all of the inconveniences and labor of slaking, ageing and screening on the work, and in addition produces plaster of greater strength than lump lime. It will doubtless be of interest at this time to enumerate the principal advantages of hydrated lime plaster.

1—It has greater strength than lump lime plaster.

2—It has high-fire resistance.

3—It remains plastic for a sufficient length of time to enable the mechanics to work true surfaces and angles with a minimum of labor and effort.

4—It will adhere to tile, brick or concrete.

5—Ridging due to expansion of wood lath can be readily corrected.

6—It acts as a preservative of metal lath, due to the absence of acidity.

7—If it is painted or decorated, a sizing coat is not required.

8—It improves the acoustics of the building, because it is less resilient.

### Hydrated Lime in Stucco

The word "stucco" as used in this country applies to exterior plastering; and due to the readiness with which it lends itself to artistic treatment and the production of pleasing effects at reasonable cost, it is daily gaining in favor. The principal requirements of stucco are plasticity during application, permitting good workmanship with minimum effort, and water tightness. Being exposed to the weather, its principal ingredients are Portland cement, hydrated lime and sand. The manufacturers of Portland cement, and the various manufacturers of lathing materials include 10 to 25 per cent of hydrated lime in their specifications in order to produce plasticity and water tightness.

Quaker Oats Building, Cedar Rapids, Iowa, Where Hydrated Lime in the Concrete Made Cement Grout Coating Unnecessary.

Concrete Being Conveyed Over 400 Feet by Chutes with the Aid of 10 Per Cent Hydrated Lime.

### Hydrated Lime in Brick Mortar

The slaking of lime and mixing of mortar is frequently entrusted to common laborers without sufficient knowledge of the requirements and the importance of their task. Lime is often improperly slaked—burned or drowned—insufficiently aged and the mortar irregularly proportioned. The fact that hydrated lime is furnished in packages of definite weight and that the quantities can be measured in a dry state makes proportioning accurate, and inspection convenient.

As to comparative strength of lump lime and hydrated lime, tests made under the supervision of Prof. Ira H. Woolson, of Columbia University, show that both in tension and in compression hydrated lime mortars show greater strength than mortars made of lump lime.

Many architects and engineers were, and some still are, of the opinion that the more Portland cement a mortar contains, the stronger it is, and that the addition of lime weakens it. These assertions and assumptions were based on laboratory tests made on specimens independently of their contact with brick; but such conditions do not exist in the field. To determine the strength of mortars in contact with brick, Prof. James S. Macgregor, of Columbia University, tested 74 brick piers 8 by 8 inches by 7 feet high, each laid up by a brick mason in the usual way. Face brick of high compressive strength were used with a view to causing deformation and weakness to predominate in the mortar rather than in the brick. Seven different mixtures were used. All mortars were 1:3 by volume, but the proportion of hydrated lime to cement was varied as shown in table No. 1.

**Table No. 1**
Key to Mortar Mixes

| (All measurements are by volume.) | Per Cent of Cement Replaced by Hydrated Lime. |
|---|---|
| Mixture No. 1—1 cement, 3 sand | |
| Mixture No. 2—1 cement, 3 sand | 10 |
| Mixture No. 3—1 cement, 3 sand | 15 |
| Mixture No. 4—1 cement, 3 sand | 25 |
| Mixture No. 5—1 cement, 3 sand | 50 |
| Mixture No. 6—1 cement, 3 sand | 75 |
| Mixture No. 7—1 hydrated lime, 3 sand. | |

**Table No. 2**
Face Brick Piers

Ultimate Resistance—Pounds Per Square Inch

| Mixture number | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Age 7 days | 2630 | 3080 | 2890 | 3120 | 2670 | 1945 | 1535 |
| Age 28 days | 2840 | 3170 | 3230 | 3470 | 3100 | 2370 | 1870 |
| Age 3 months | 2840 | 4435 | 4300 | 4170 | 3820 | 2720 | 1950 |

As can be seen from table No. 2, the general result was that all mortars containing hydrated lime up to the point where 50 per cent of the Portland cement was replaced by 50 per cent hydrated lime (by volume) the masonry showed greater compressive strength than the straight Portland cement and sand mortar. It is interesting to note that the piers built with mortar of this last composition (designated as No. 5) showed at all ages a greater strength than a cement mortar. At 90 days the strength was more than 30 per cent greater.

By again referring to table No. 2 it will be seen that there was a total of only 70 pounds of cementing agent used in 300 pounds of sand; thereby a saving of approximately 30 per cent of the cost of cementing materials was effected over the cost of the pure cement mortar. This item, which seems insignificant in itself, amounts to over sixty cents for every 1,000 brick laid up. To sum up, then, the advantages of the No. 5 mix mortar, it may be said that besides a great saving in labor due to its excellent plastic qualities, there is a gain of 30 per cent in strength and an approximate saving of one-third of the cementing agent.

### Hydrated Lime in Concrete

Though our knowledge of concrete is far from complete there have been established as the result of years of study and observation, both in the laboratory and in the field, certain rules, which, if followed, will assure concrete of satisfactory quality. There are, however, so many variables which affect the quality of concrete in the field, that it is no wonder that it is not always what it should and is intended to be.

No attempt will be made to discuss all of these variables, but attention will be focused on one of the most important, viz., the quantity of mixing water and consequently the consistency of the mixture.

It is fully demonstrated that, within certain limits, the more water used in mixing concrete, the lower will be its compressive strength. Tests conducted by the United States Bureau of Standards (Technologic Paper No. 58), Professor Abrams, of Lewis Institute, and others, have conclusively proven that the strength of concrete of a very wet consistency frequently found in practice may be as low as 20 to 25 per cent of the maximum which can be obtained with the same materials, but with a smaller quantity of water. It is true that the consistency which gives maximum strength is

**Twin Peaks Tunnel, San Francisco, Cal., Where 2,000 Tons of Hydrated Lime Were Used in All of the Concrete.**

too dry for handling and placing, and for this reason it is necessary to use somewhat more water and sacrifice some of the strength to practical considerations, namely, mobility and workability.

The weakening effect of an excess of mixing water is partly mechanical, partly chemical; in most cases it is both. If concrete is mixed with an excess of gauging water, the grout runs away from the aggregates and leaves honeycombs, stone pockets, and other weak spots. Furthermore, this excess of water will cause the materials of which the concrete is composed to segregate and settle in strata according to their respective sizes. These are mechanical defects whose weakening effects are too apparent to need any further proof.

Everyone who has had opportunity to observe concrete placed in a very wet consistency is acquainted with the grayish substance, termed laitance, which rises to the top of the concrete after being placed, or after the excess water has ceased to be agitated. This laitance represents just so much Portland cement lost.

The consistency of concrete as used in the field is a compromise between maximum possible strength and a consistency suitable for economical handling and placing. These considerations are of paramount importance. We may define the best practical consistency as the driest consistency which will permit economical and practical handling in the field. As

simple as the definition may seem, there is frequently a divergence of opinion between the architect or engineer and the contractor as to the interpretation of what constitutes the "best practical consistency." The fact is that it is common practice to mix concrete at too wet a consistency. As a rule this is done to permit easier and more economical handling and placing of the concrete, but sometimes it is done to make it appear well mixed, though the mixing time has been cut down; and often for no other reason than plain ignorance. To remedy the two latter causes of the use of an excess of water is only a question of supervision and inspection, but to the first one it is necessary to give serious consideration.

The ease with which concrete may be handled and placed depends principally on two qualities, namely, mobility and workability. Since it has been shown that to try to produce these qualities by the use of an excess of water is detrimental to the strength and permeability of the "finished product," let us see by what other practical and economical means they may be produced.

It is well understood that hydrated lime is the most plastic of all building materials. When added to Portland cement mixtures it acts as a lubricant. This is due to the fact the hydrated lime, upon being brought in contact with water, loses its grandular character and is converted into a colloidal paste of extreme smoothness. This property of hydrated lime is turned to good account by using small quantities as an addition to concrete, in order to impart to the concrete mixture the degree of plasticity and mobility required for easy and economical placing, without the necessity of using an excess of mixing water. As a result the hydrated lime may be considered as a lubricant, both external and internal.

As a result of the external lubrication it will slide through chutes for a longer distance and at less inclinations, will leave carts, barrows and buckets easily without having to be dug out, even after transportation for considerable distance, or after considerable waiting in case of interruption. Recent experience has also demonstrated that the addition of hydrated lime to concrete greatly facilitates the transportation by the pneumatic method. For the same reason it will fill the forms more completely with less spading and produce more nearly perfect exterior surfaces. The fact that it will surround the reinforcing steel thoroughly insures full bond and better protection. All this occurs at a consistency where the matrix is firm enough to keep both the fine and coarse aggregates in suspension and uniformly distributed throughout the mass. The matrix being of a sufficiently firm consistency, it will not flow away from the aggregates and cause the formation of stone pockets and honeycombs, but clings to the coarse aggregate.

Besides eliminating the larger or visible structural defects it reduces the size of the smaller voids through internal lubrication which permits the particles of the aggregates to easily slide over each other, thereby causing them to range in a relative position, which is the most advantageous for maximum density. Finally even these pores of greatly reduced size are filled with finely divided collodial hydrated lime.

After the particles of hydrated lime repose in the pores their role is not ended. The water that is required to convert the hydrated lime powder into paste is held until after the Portland cement has used up its own gauging water for partial hydration, then this water is turned over to the Portland cement for its further hydration and development of the colloid, which is important for the development of both strength and density. In other words, hydrated lime may be considered as an internal reservoir to furnish moisture to the cement as needed to cause more nearly complete hydration. The effect of hydrated lime on the increased hydration of cement is noticed most strongly when concrete specimens are stored in air before being broken under compression. Hydrated lime in concrete in quantities from 5 to 20 per cent by weight of cement increases the strength of specimens 20 per cent at the 90-day breaking period—when the specimens have been given air storage.

Portland cement being a hydraulic material, it is most favorable for the development of strength to store the specimens of concrete where they will be subjected to damp conditions. Specimens stored in the air, however, do not have the same opportunity of developing strength, and consequently show a much lower strength than specimens stored under damp or wet conditions. As a large majority of concrete placed today is exposed to ordinary atmospheric conditions, a change in the method of storing specimens—from wet to air storage—is gradually being recognized as necessary in order to give a truer understanding of the strength that will be developed with any particular aggregates in field practice. When specimens are tested in the laboratory according to conditions approximating field practice, the value of hydrated lime from the viewpoint of increasing strength is plainly seen.

### As a Watertightener in Concrete

No reference has been made so far to hydrated lime as a watertightening medium. By analyzing the foregoing, it is fair to conclude that a concrete possessing the properties imparted to it by hydrated lime will be watertight. It is a matter of record that it was its watertightening quality which caused its earliest use in concrete. The United States Bureau of Standards, in reporting on a test of upwards of forty materials recommended for making concrete watertight, states on page 59 of the Technologic Paper No. 3, as follows:

"This is the most efficient medium employed and resulted in an almost impermeable mortar at the two-week test. Its value is probably due to its void filling properties and the same results could be expected from any other finely ground inert material, such as sand, clay, etc."

**Five to Ten Per Cent of Hydrated Lime Was Used for Water Tightening and for Increase in Plasticity of Concrete on This Operation. View of Interior of Superior Street Viaduct, Cleveland, Ohio.**

Considering these materials merely as void fillers the various substances other than hydrated lime might be effective, but to produce sand in as finely divided state, or clay as free from organic matter, as hydrated lime, would prove in most cases commercially prohibitive.

Sanford E. Thompson used hydrated lime in the construction of the Waltham (Mass.) reservoir and his account of the preliminary tests and practical applications contains much useful information regarding the use of hydrated lime in making concrete watertight.

There are certain technical and economic criteria which determine the degree of usefulness of every structural material and the study of a large number of concrete structures, both in course of erection and during years of service, has shown that hydrated lime as a watertightener possesses the following highly desirable technical and economic requirements:

1—It in no way injures concrete, either chemically or physically.

2—Its character is chemically similar to that of cement.

3—It enters the mixture in its most effective form and does not rely for its waterproofing properties on chemical reactions which have to take place after it is brought in contact with the ingredients of the concrete.

4—It is a mineral material and therefore not subject to decomposition or decay.

5—It is of a colloidal nature and therefore lubricates the mass of concrete during handling and placing, and is a void filler.

6—It mixes readily with water, and therefore does not add to the cost of labor for mixing concrete.

7—It is inexpensive and does not increase the cost of concrete materially.

8—It is a staple product manufactured in all parts of the country and can be obtained wherever Portland cement is sold and used.

There is one phase of waterproofing which deserves more attention than it has heretofore received. In the past people have been accustomed to thinking it necessary to make concrete watertight only when it was to be used in a structure which was to contain or exclude water, such as reservoirs, tanks, sewers, dams, etc. Extensive investigations to the effect of alternate wetting and drying on concrete have brought out facts which indicate that all concrete that is exposed to the elements should be as impermeable as possible. The fact is that moisture changes will cause much greater volume changes in concrete than temperature changes. According to Prof. Albert H. White, the volume changes caused by the alternate wetting and drying of concrete are sometimes several hundred times greater than those caused by the usual temperature changes between seasons. This seems to indicate that surface and even internal disintegration which occurs sometimes years after the completion of the structure, may be attributed to this cause. That frost action is in proportion to permeability, does not require any proof.

Sanford E. Thomson, to whom I referred before, and who was one of the earliest users of hydrated lime in concrete in this country, in a late edition of "Concrete, Plain and Reinforced," recommends the use of 5 to 15 per cent hydrated lime, by weight of cement, the quantity to be used depending on the nature, size and grading of the aggregates, especially the sand, and the purpose for which it is used, whether for waterproofing or general improvement of the concrete.

To make concrete watertight the following quantities have been found to give satisfactory results:

To at 1:2:4 concrete mix add 8 to 10 pounds of hydrated lime for each sack of Portland cement used.

To a 1:2½:5 concrete mix add 12 pounds of hydrated lime for each sack of Portland cement used.

To a 1:3:6 concrete mix add 15 pounds of hydrated lime for each sack of Portland cement used.

The hydrated lime is introduced into the mixer with the other materials without any preparation and mixed in the usual manner and for the useful length of time. One gallon of hydrated lime weighs approximately five pounds.

In view of recent tests showing an approximate increase of 20 per cent in compressive strength of concrete; from the fact that many of our best and most prominent contractors use hydrated lime in plastering, stucco, and brick mortar, and for plasticity and watertightening in concrete; and because hydrated lime is universally obtainable and moderate in price, good practice in engineering will dictate its use in all of the above classes of construction work. Let our motto be "Make good construction better."

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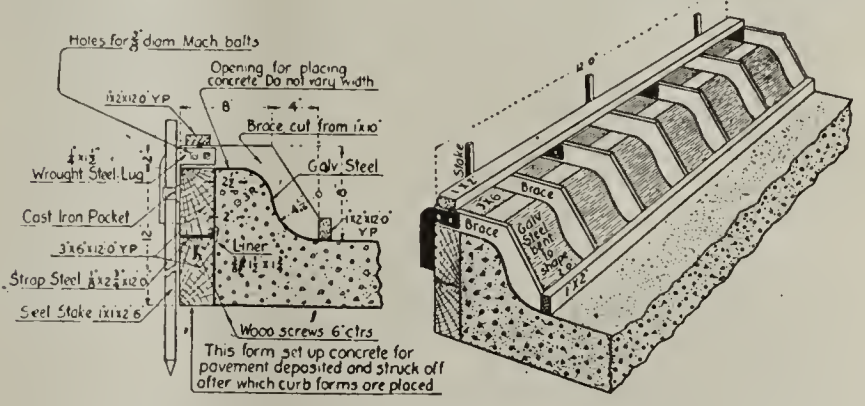
## Form for Integral Curb Construction

The advantages of integral curb construction are becoming widely recognized. A form for this type of curb and suggestions for its use are given in a recent issue of the Concrete Highway Magazine, from which the matter in this note is taken.

In building this curb some contractors have placed their forms and filled them at the time of the placing of the concrete for the pavement proper. The difficulty with such a procedure is that the water removed by rolling and with the belt finds its way to the gutter line and must be removed by brooming. However, even with the most painstaking efforts some laitance will remain along the gutter and will subsequently check, resulting in a rough flow line.

To avoid such a condition many contractors are following the plan of placing and finishing with the roller




**Details of Curb Section and Form.**

and first belt the pavement proper, then placing their curb forms and constructing the curb. This is the method that is recommended, because of the facility in finishing, in removing the excess water, and in avoiding any laitance effect.

In order that this procedure can be followed it is necessary that the retaining form for the curb be built up in two sections, as shown on the drawing. The first section serves the purpose as a side form and permits the roller and belt to be operated over it. After the first belting, the second section of this form is placed and the integral mold put in position.

The only objectionable feature to such a method is that it necessitates wheeling sufficient concrete for the curbs from the mixer to where the curb forms are in place, but this additional cost is offset by the increased speed and facility which can be attained on curb finishing work.

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J. E. Freeman of the Portland Cement Association addressed the state oil and gas men in session at Huntington, W. Va., explaining to them the use of concrete oil tanks as a conservation measure. The 500 members of the association were much interested in the proposition. These tanks are built underground and besides keeping oil at an even temperature the year round they cut down danger of fire loss but their chief value at the present time is that they save steel that would otherwise be put in tanks.

# The Motor Truck and Trailer in Road and Street Building, Repair and Maintenance

(Continued from August Issue)

City of Lansing

Department of Parks and Public Works, Ward C. Hill, Superintendent

December 5, 1917.

Duplex Truck Company,
Lansing, Michigan.

Gentlemen:

The City of Lansing is now operating three Duplex 4-Wheel Drive Trucks and the savings over teams and wagons which have been replaced will be sufficient to pay for the Trucks in less than a year.

One of the Duplex Trucks hauls 2½ yards of gravel to a trip, and makes seven round trips of 12 miles each per 10-hour day; a total distance of 84 miles.

The actual cost of operating one of our Duplex Trucks follows:

| | |
|---|---|
| Driver's wages | $3.50 |
| Gas for 84 miles | 2.64 |
| Oil | .15 |
| Grease | .10 |
| Depreciation | 3.60 |
| Total | $9.99 |

On arriving at the truck's daily depreciation we figure the life of the truck to be four years, but I firmly believe that the trucks will stand up for six or eight years, or double the life that we have used as a basis for our depreciation figures.

Figuring 2½ yards to a load and seven trips per day, a Duplex will haul approximately 18 yards of gravel at a cost of 55½ cents per yard.

Our cost for hauling a yard of gravel the same distance with teams was $1.25.

Thus you will see that our saving on each yard of gravel is practically seventy cents. The saving on 18 yards—a day's work for a Duplex—is approximately $12.60, or over $3,126 for a 50-day working year.

We are also using two of these trucks to haul asphalt concrete from our plant to street, and we find that they replace eight teams and deliver the asphalt on the street in far better condition. The City of Lansing is now using fourteen trucks in its different departments and we find there is no comparison between the horse-drawn and motor-driven vehicle.

Very truly yours,

W. C. Hill.

### Helping Uncle Sam

"Somewhere on the coast" near San Francisco, the government faced a problem. It consisted of moving four twenty-eight-foot guns, weighing ten tons each, a distance of seven miles over roads so winding that it constituted a very difficult and delicate undertaking.

Several hauling contractors gave it up, but the King Drayage Company agreed to tackle the job with a standard Garford 5-ton truck.

In describing the accomplishment of this feat, Mr. W. H. Wickenger, California Manager for the Garford Motor Truck Company, states: "The haul was from the beach in sand varying from three to nine inches in depth, over a very winding road to the highway. This could only be negotiated by a short wheelbase truck like the Garford on account of the turns and even so at times the front of the truck and the end of the gun were rubbing the bank."

"The haul took five hours to the gun. The removal of the four guns had formerly required four days with three times the equipment, occupied but two days. The Quartermaster's Department were so highly pleased with the ease with which this was done and the saving in time that they wanted to hear all the details concerning the handling of the proposition."

### Connecticut Realizes the Importance of Her Highway

The State of Connecticut has been a leader in the work of mobilizing its resources for the successful prosecution of America's part in the war. In many fields it has been a pioneer, until to-day Connecticut's example is watched for with interest, and followed by those who are in charge of the war work in other States.

One particular field in which this State has led most of the others, is in the organization of its highways transportation system. As every one knows, she had for years been building up an excellent net work of State roads. This with other subsidiary and feed roads cover the State completely and bind together her numerous munition-producing cities with their markets and shipping points along the Atlantic Coast.

New England is served by one great railroad system. Until the European war broke out, this railroad was sufficient. But with the war orders from abroad the output of the shops and mills and factories increased almost over night to many times the normal amount and the railroad began to be smothered. The tie up of freight at terminals, caused by the lack of ships, added to the shippers' troubles. It was at this time of freight embargoes that the motor truck first came into its own as a practical agent for moving freight. There are many factories in the New England States that were able to keep open at that time only because they could bring in over the highways the raw materials that were necessary for them.

The crisis of the pre-war traffic congestion passed. For a time the conditions became almost normal and the railroad was able to hold its own against the manufacturers. But New England had learned her lesson and had come to realize the strategic importance of her highways. And so when the United States entered the war and the railroad again became swamped with more raw material and finished product than it could handle, Connecticut was ready. The State Council of Defense suggested legislation that has made of these highways arteries of commerce of the highest value, as a complement to the system of rail transportation. Laws have also been passed that have maintained the roads of the State at the highest efficiency despite a winter of unprecedented vigor.

The Council of Defense realized that the Motor Truck was the solution of the problem, and while practically every one else was spending their time talking about the possibilities of the motor truck, they took steps to utilize it as such. The return system of truck transportation was instituted. By this system a Connecticut truck now-a-days runs loaded both going and returning. This has been achieved by the systematization of inter-city trucks, by bureaus established in large cities of the State, under the auspices of the local Chamber of Commerce of War Bureaus. These bureaus keep on file a list of motor trucks available for local or inter-city transportation. The shipper has only to consult one of these lists to obtain a return load for his truck. In this way the usual efficiency of the motor truck is increased 100 per cent.

The law requiring the Highway Commission to keep the State roads open at all times of the year has had the result of making possible shipments over the road of numerous supplies for our own and Allied Governments, that could not possibly have been sent out by rail under the conditions existing this winter. It is of the greatest national importance that the great munition center of America never lacks transportation facilities.

One of the most important stretches of highway is the Boston Post Road, running from New York through Bridgeport and New Haven. This stretch of road is under the care of R. M. Donnelly, Commissioner of Repairs. How well he has done his work may be known from the fact that despite the heavy snowfall of December and January, the State road has been continuously open full width for every kind of service up to the heaviest hauling. Mr. Donnelly's supervision extends over seventy-five miles of State highway. The cleaning of such a stretch between sunset and sunrise is a big man's job.

To do this work of clearing, Mr. Donnelly uses four motor trucks, which are equipped with adjustable snowplows. The two larger of these trucks are built in Bridgeport, by the Locomobile Company. The plow blades are of steel and are ten feet long and fourteen inches wide. They are hung on a semi-circular steel frame, which is operated from the seat of the truck by a hand wheel and heavy chains. With this arrangement it is possible to set the scraper blade to either a right or left hand angle so the snow can be plowed either toward the center of the street or toward the gutter. There is an automatic blade release so constructed that when the cutting edge strikes an obstacle such as a manhole cover or car track the blade releases to pass over the obstacle and then immediately returns to its operating position.

In clearing the highways in the country, two trucks are used in tandem formation and about a block apart to obviate the danger of absolutely blocking all traffic behind. The truck in the rear follows to the right or left of the forward truck, catching up the snow in its wake and throwing it and the snow untouched by the first truck, farther to the side of the road. After the heaviest snowstorm these trucks cover a minimum of thirty miles in a working day, clearing the road for a width of eighteen feet and averaging from three to three and one-half miles on a gallon of gasoline.

It has been proven that this method of clearing the State highways is a complete success and that it is the cheapest method yet discovered of dealing with the snow problem. It is predicted that in the near future many cities will use this method also. New York City has over three hundred plows, but has to hire trucks to use with them. Philadelphia is better equipped, owning both plows and trucks, and is not faced with the necessity of putting its snow-clearing work out at contract. The great Lincoln Highway, from Cleveland east, has been kept open this winter by the use of the same plow. It has been found that the larger trucks of high power are by far the most efficient in this work.

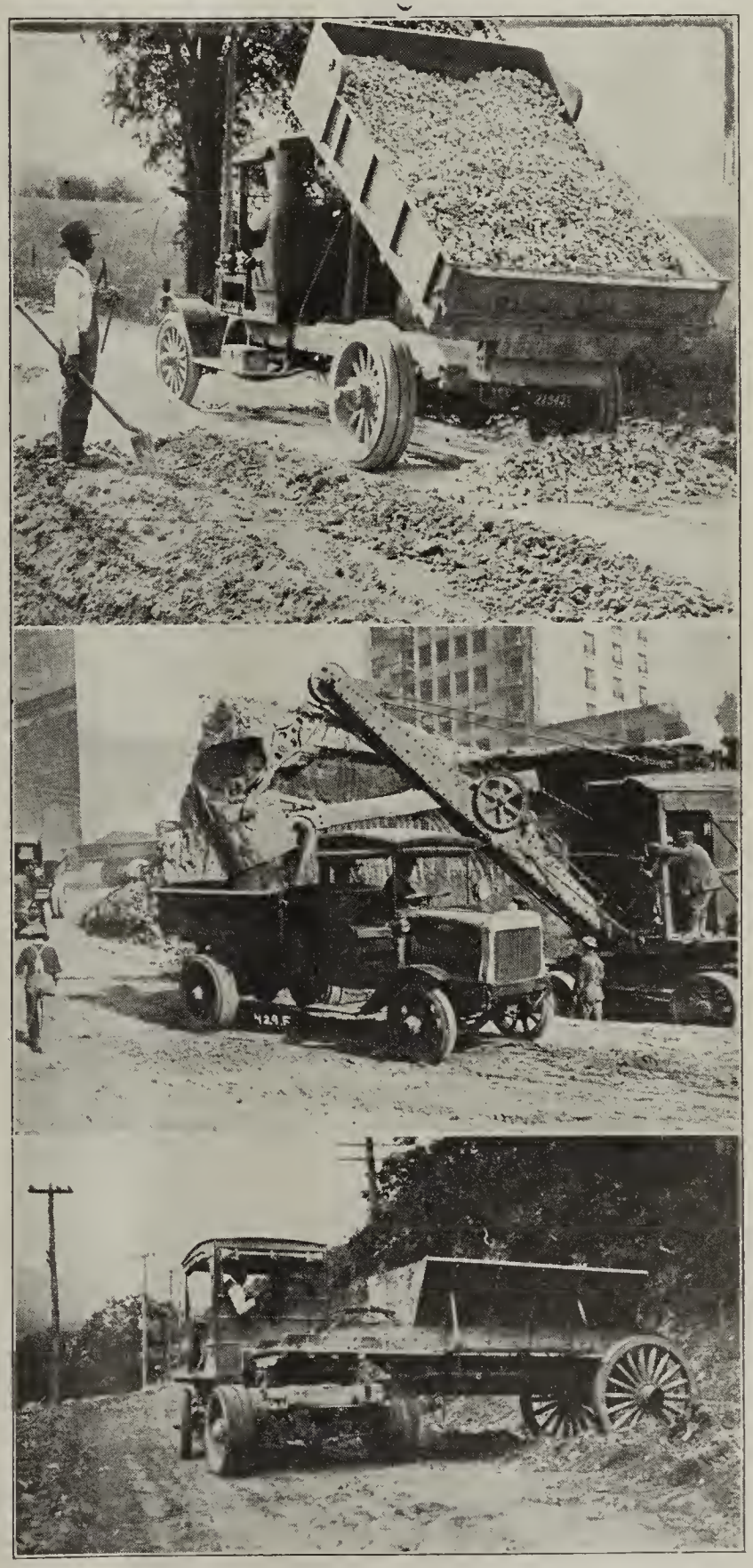
It is surprising to learn what a large effect the hills have on the cost of this work. Near the city of Bridgeport, where the country is flat and the hills are few, the cost is $7.50 per mile. When operating on the hills in and near Greenwich, the cost is between thirty dollars and forty dollars per mile.

It is merely a question of how long it will be before the other States realize the national importance of their roads and follow Connecticut's lead in keeping them open to all sorts of weather. The railroad of the nation cannot handle the traffic that war makes necessary. The motor truck must do its share. In order that it may do it most efficiently the roads of the nation must be kept always in the best possible condition.

**Laying National Pavement in Pittsburg, Kansas**

"A marked saving in hauling costs was effected in street paving work at Pittsburg, Kansas, by the use of motor trucks. The Williams Construction Company, of Pittsburg, had the contract for laying a considerable mileage of National Pavement. On one street the work called for the construction of one mile of this type of surfacing. The National plant was located about two miles from the commencement of this particular job, the average haul being two and one-half miles."

"For hauling the paving material to the street, the contractor used two Model R three-and-one-half-ton



Acme 3½-Ton Dump Body Truck, Owned by Louis Hoffman, Grafton, Wis., Hauling Crushed Stone for State Road at Belgium, Wisconsin.

Loading a Five-Ton Dump Body Truck with Steam Shovel on Street Construction at Canton, Ohio.

View Showing a Trailer Used in Connection with a Motor Truck in Road Work.

Indiana worm-driven trucks, equipped with Wood's hydraulic hoists, and carried a three-and-one-half-yard steel dump body."

"The asphalt was dumped into the trucks at the plant, each batch weighing 818 pounds. Ten batches were hauled at each load and ten round trips, eight miles each, were made daily, a round trip taking about forty-eight minutes. Part of the distance covered was on a dirt road and the rest on a brick pavement."

"Before the trucks were obtained the contractors employed wagons. Four trips were made daily, each team carrying five batches to the load, making the total day's work for one team and driver twenty batches hauled, or 16,360 pounds of National paving material delivered on the job at a cost of four dollars. The cost of ten teams and drivers delivering 163,600 pounds daily would be forty dollars. The same amount was delivered by the two Indiana trucks at a cost of ten dollars per day."

"An interesting feature of this work was that the construction company has been forced to recognize the Laborers' and Teamsters' Union, but just at the time the union scale went into effect the contractor received his trucks and was able to lay off ten teams." —(From Engineering and Contracting.)

### "American-Built Military Roads to Endure"

"When the history of this war has been written," says D. O. Skinner, International Motor Company, "it will be more fully realized what a vital part good roads have played in the great struggle. At the start, motor trucks leaped to the front as the modern pacemaker of flexible transportation, and ever-increasing war needs have demanded new roads and better roads as most necessary for the proper backing up of fighting forces.

Motor trucks by the thousands will contribute an enormous advantage to U. S. road engineers engaged in new construction back of our lines. It is estimated that twelve hundred miles of highways will be built in 1918 by American road engineers in the rear of the firing line in France. To the special road building battalions is delegated the important task of keeping lines of communication constantly open, and Mack trucks working in conjunction with modern American road machinery will help to build new strategic lines and keep communicating roads in constant repair. The Mack fleet will be composed of several thousand dump trucks, hot road oilers, pressure sprinklers for making water-bound macadam, gasoline tank trucks, printing press trucks for printing blue prints, instructions, plans, reports, etc., machine shop trucks, blacksmith and tool repairing trucks.

"Although France is particularly well endowed with good roads, it is often necessary for military reasons to construct many new lines. An estimate places the present mileage of French roads at one mile of road for each one and one-half square mile of ground surface. The tremendous task of keeping these roads in perfect condition and building new ones at the same time, can well be imagined when it is realized that so far as wear and tear are concerned war traffic is ten times as great as that on Fifth Avenue, New York.

"Most of the roads of France are built of water-bound macadam. The peculiar nature of the French soil, which is of limestone formation, lends itself readily to compaction under the road roller and makes a very good road-building material, although it requires constant maintenance. The British, however, introduced the tarred surface road and an increasing mileage of that type is found back of the British lines. One of the principal objections to the water-bound macadam road near the front is the dust which rises from it in dry weather under heavy war traffic. Clouds of dust draw artillery fire from the enemy, and for this reason United States engineers, in planning road construction and maintenance near the American front, will probably utilize large quantities of tar coating, which is freely obtainable in France.

"Of course the pressing object of American road construction is to provide for the immediate needs of our forces, but the work carries with it both utilitarian and historic value. When Caesar's Legions poured through Gaul and into Britain and returned to Rome again, they left in their wake military roads so carefully constructed that many sections remain to-day as permanent monuments of their presence. American system and modern methods likewise promise to contribute many enduring benefits to France. Our road building battalions are going about their work scientifically and with an object fully as far-reaching as the work of Caesar. All is not destruction that comes out

**Good Roads Truck and Two Trailers Which Reduced the Cost of Hauling Road Material in Fayette County, Kentucky.**

of war, and many American-built highways will remain to become of immeasurable value to France in conducting her commercial and social intercourse."

### Trucks Speed Up Logging Operations

The superiority of trucks over horses in logging operations has been repeatedly demonstrated and no better illustration is to be had than the experience of the White Truck Logging Company, of Tacoma, in developing an irrigation project in western Washington. The economical features of trucks in the logging industry such as the saving of time and money have never been advantages that stamp the truck as the ideal medium for transporting the giant timber of the West.

In the working out of the Washington irrigation project the government selected Lake Ketchees as the water basin. This lake is located in the Cascade Mountains about three and one-half miles from Easton, Washington, a small town on the Northern Pacific Railroad. A dam was constructed across the lower end of the lake in order to raise the lake level about forty feet and this necessitated the cutting and falling of timber which amounted to approximately nine million feet.

As the water rose, the logs floated and the problem then presented itself of getting these logs to the rail-

road. The Cascade Lumber Company, of Yakima, Washington, purchased the timber and for a time attempted to move it by the use of teams. Horses soon proved to be expensive and entirely unsatisfactory for the reason that "snatch" teams were required to be on hand at all times to start the loads whenever it was necessary for a team to stop. The company was further handicapped by many of the horses becoming ill during the hot weather and teams were frequently out of service.

The best average haulage made by the teams was forty thousand feet per day. After installing two three-ton White trucks with trailers the average number of feet of logs hauled daily for two seasons was sixty thousand feet. The haul was three and one-half miles over rough roads with grades in stretches as high as ten per cent. No difficulty was encountered in hauling the logs with the White trucks. The average truck load was three thousand feet, but occasionally loads would reach five thousand two hundred feet.

The loading was accomplished by means of a gasoline engine, which was used to roll the logs out of the lake upon a landing and thence onto a truck by the aid of a gin pole. At the railroad yards the unloading and loading was accomplished by a steam donkey engine. A semi-trailer was found to be the most expedient in hauling the logs, the coupling pole, or reach, being equipped in such a way that it could be lengthened or shortened to accommodate the various size of logs hauled. Most of the logs were forty-two feet in length.

The speed and efficiency of the trucks made it possible for the owners to clear the land in a comparatively short time and enabled the government to proceed uninterrupted with the irrigation project.

### Cross-Country Hauling

A striking example of what good roads are making possible in the way of cross-country hauling is furnished by the Goodyear Tire and Rubber Company, who for several months have been operating a fleet of motor trucks between Akron and Boston, a round trip distance of fifteen hundred and forty miles.

With the exception of about thirty miles of very poor roads, between Akron and Pittsburgh, the entire route is over improved roads. From Pittsburgh to New York the trucks travel the Lincoln Highway, then over the Boston Post Road to destination.

Carrying a capacity load of rubber heels and soles urgently needed by the shoe factories of Massachusetts, a giant Packard truck, newest addition to the fleet, recently clipped eleven hours from the schedule which has been established for this run.

The distance from the Rubber City to Boston is seven hundred and forty miles. The Packard completed the journey in seventy-seven hours elapsed time, forty-nine hours actual running time, at an average speed of 14.9 miles an hour for the entire trip. The huge pneumatic tires, 44x10 Goodyears, with which the truck is equipped, allow it to be driven safely over the mountain roads at touring-car speed.

The Goodyear Company was one of the first to recognize the feasibility of inter-city hauling and six trucks are now in this service. They carry finished products to the New England branches and return with tire fabrics from the company's mills at Goodyear, Conn.

A five-ton Packard, the pioneer of the fleet, to date has traveled thirty thousand miles over this route, having completed nineteen round trips.

### Street Cleaning by Motor Truck

Before automobiles had educated people to higher standards in questions pertaining to highways and streets, the sprinkling cart was the approved and accepted instrument for street maintenance. Sprinkling was not street cleaning, but merely a way to alleviate a nuisance by temporarily laying the dust and spreading a blanket of mud over an accumulating bed of dirt.

Motorization of street transportation has brought us better pavements and more exacting standards on the problem of really keeping our cities clean. The white wing with his brush and shovel is passing out with the horse and most city street cleaning departments have progressed through the successive stages of horse or power street sweepers, on through experiments with the portable line flusher, or the two-men reel system of hydrant flushing, and the time is now ripe for the installation of automobile power flushing apparatus.

The street cleaning department of the City of Buffalo purchased one of the Pierce-Arrow tractors early in the winter of 1916 and used it for hauling garbage wagons and with a snow plow for cleaning snow through that winter. In the spring of 1917, this tractor fitted with the power transmission was delivered to the Hvass Company, and a trailer and tank outfit was obtained. The city's experience with this first flusher was so satisfactory that they shortly placed an order for two more, which were delivered back from the flusher manufacturers early in October, 1917.

These three outfits were operated on street flushing until winter arrived. The tanks were then uncoupled and stored while the tractors have since been operated continuously with snow plows.

The records and annual reports of the Buffalo Commissioner of Streets show what street cleaning by the various methods mentioned above have cost. The Portable Line Hose Flusher rigs could be made to give very good results but were cumbersome, blocked all traffic, and their operation involved many delays and required considerable labor. Street cleaning by this method cost the city $1.40 per great square of ten thousand square feet area. This method is obviously too expensive. The Two-Man Reel method was next tried to overcome objections inherent in the unwieldy portable line, and costs were reduced to fifty-six cents per great square. With Motor Flushers all charges for investment and operation have been included and with their limited experience in using this method the costs of flushing, as stated in Commissioner Schwartz's last annual report, have been further reduced to twenty and one-half cents per great square. Needless to say, the results are highly gratifying and the Street Commissioner believes that with further attention and study of the problem considerable reduction can be made in last year's cost figures.

To compare street flushing with street sprinkling is like comparing a steam-cleaned job on your suit of clothes with results obtained when a pullman porter brushes you on his tip in the morning. A sprinkling cart, a horse-drawn sprinkler, and six gutter men with brushes, followed by four pick-up wagons and drivers constitute a street-sweeping gang and can clean approximately 225 great squares per night. The cost with this method, even at the old wage scale, could not be brought under twenty-eight and four-fifths cents per great square. Power-operated sweepers have proven to be expensive experiments, upon which maintenance has been excessive and breakdowns frequent. Such equipment is costly and short-lived and at best sprinkling and sweeping is an unsanitary and unsatisfactory makeshift. A tractor flusher operating eight hours has averaged approximately the same area cleaned for a night's work and the cost for flushing is brought down even below that for operating the sprinkler-sweeper-shovel gang.

The story of tractor flusher performances and costs can be more readily understood by reducing our data and figures to the basis of one night's work. Tabulated below are averages from last year's reports and records for the machines under observation here:

Hours operated .....8
Mileage on odometer.....38 4-10

Work done, ten miles of forty-two-foot wide streets, washed down with two cuts, or twenty miles run with flusher operating. Area cleaned 222 great squares. Gasoline thirteen and one-half gallons. Water used thirty-five tanks full—seventy thousand gallons. Area cleaned per gallon of water use—thirty-two square feet. Labor required, driver, $3.00 per day, helper, $2.50 per day. With each flusher the city charged two gutter men at $2.50 per day and two teams with drivers on garbage pick-up at $5.00 per day.

It is to be noted in this connection that with the limited number of outfits available the work has been in a large measure confined to streets in the down town business districts where there is considerable cobblestone pavement and where traffic is heaviest. On these streets it is of course necessary to use a greater quantity of water than would be required for washing asphalt pavement and the progress that can be made is much slower than would be found in the majority of our city streets.

In their experience of last season they were able to undertake only a limited amount of cleaning work in the residential districts where on thirty-foot streets very good service was given with a single flusher and where they only went over a street once each week. In such streets they could do better than twenty miles of street in eight hours. Where the trucks were used, however, the street department endeavored to go over the streets in the business section three times per week.

You will note from a study of the above average day's record that the time consumed from filling and emptying a tank of water is approximately from twelve to fifteen minutes. This is found to be divided into from six to eight minutes for discharging the load and from six to seven minutes from getting to the nearest hydrant, which is located on every second street corner, for filling the tank and getting back to the place where flushing was discontinued. In practice, it is found best to operate for flushing with the truck running down hill so that the full tank is taken back and the work progresses in one direction. This accounts for the showing that mileage actually run appears as nearly double the distance over which flusher is in operation. As a matter of fact, in last year's experience, these outfits were used but very little for sprinkling, as the department here in Buffalo does not consider this real street cleaning in any sense of the term. They also mention in their report that credit should be given to the flushers for materially cutting down on the cost of surface sewer maintenance as in places where street flushing was done it was not found necessary to send the sewer maintenance gangs to open up obstructed lines, as had been the case in the past, for the street cleaning also served to flush the sewer lines.

To quote from the experience with the installation described here there is bound to be much authority in the statement made by the Buffalo Commissioner of Streets, Mr. Schwartz, in summing up his chapter on street cleaning in annual report for 1917. He writes:

"There is a general impression by all health and municipal street cleaning experts that flushing is the only sanitary way of cleaning streets. This impression we also have, and would respectfully recommend that within the near future the street cleaning division be motorized, and only flushers used instead of the old-fashioned horse-drawn sweepers."

Steam Shovel Loading Motor Trucks Owned by Thayer-Griffith Co., Boston, Mass.—This Combination of Equipment Makes Large Economies.

### Winter Trips Establish Garford Trucks Dependable Freight Haulers

"Naturally, we as manufacturers of Garford trucks have known their great possibilities as dependable freight haulers for some years," said E. A. Williams, president of the Garford Motor Truck Company, in telling of some of the gruelling tests to which they had put these trucks for a number of years.

"But in the recent long runs over snow-blocked roads in freezing weather we have again proven their stamina and dependability as freight haulers," Williams continued. "We have shipped cars from the plant in Lima, Ohio, to far eastern points. Whole fleets of Garfords have been sent overland, loaded with Garford chassis for our distributors and dealers over the country. The numbing cold has not affected their performance in the least, nor has it lessened the drivers' comfort to any great degree, owing to the cabs on the trucks which can be snugly enclosed.

"To set up a basis of comparison between freight shipment and truck delivery, I have considered the average time required to make deliveries by rail and

find that slow movement of freight cars, coupled with terminal delays, easily makes it possible for the motor truck to render superior delivery service.

"Any shipper can also recognize that with motor truck transportation, the cost of handling is reduced by eliminating cartage to and from freight depots.

"Under average road conditions the daily mileage of the motor truck compares favorably with the movement of a freight car under present congested conditions. With improved roads naturally the radius of action is materially increased.

"This would clearly establish the practicability of truck transport for a large area not necessarily confined to the short haul by any means. The cost of operating Garford trucks, we find, is another strong argument in their favor. Our winter shipments overland on trucks have been well within freight costs and compare favorably with express time."

Williams said that their winter shipments were not to be considered in the light of experiments because the Garford motor trucks have been doing this class of work for many years. It remains, however, for the recent traffic congestion to prove our national transportation system to relieve the railroads from those hauls which have occasioned congestion, at the same time in fact actually decreasing the cost of such movement by eliminating wasteful delays.

### "The Modern Marathoner"

In making the recent 533-mile trip, overland from New York to Akron, Ohio, in sixty hours, total time, and in forty-nine hours actual running time, a loaded three and one-half-ton Mack truck beat the fastest Pennsylvania freight delivery by forty-eight hours.

This remarkable feat of overland truck transportation was at the instance of the Goodyear Tire and Rubber Company, which maintains a through truck service between Akron and Boston. The Rubber Company now has eight trucks running on regular schedule, and what is more important, these trucks have been operated through the deep snows of the present winter.

"These overland trips serve a dual purpose," says Commercial Vehicle, "although the principal reason is to test out the giant pneumatic tires being produced by the Goodyear Company. The carrying of freight serves the practical purpose of relieving railroad congestion and gives test to the tires and trucks under the same conditions to be met in actual service. At first the truck manufacturers were skeptical as to the possibility of the project, but the Goodyear Company insisted, and finally started a truck on the first leg of the journey from Akron early in April of last year. The trip took seventeen days. To-day the same truck and others of the fleet make the identical run in four days, and in several instances a complete round trip of 1,480 miles has been made in six and one-half days.

"On the Mack record run in December, 1917, the roads were deep with snow all along the route and the thermometer registered thirteen below zero for a considerable portion of the run. Due to the fact that the truck was fitted with giant pneumatic tires all around, it was able to make a speed which would have been impossible with tires of the solid variety. Greater speed means a saving of time which is the most important element of modern business.

"These trucks are now running on a twenty-hour per day schedule, with two drivers, one of whom sleeps while the other drives. The sleeping compartment runs crosswise of the truck directly back of the driver's seat, and in winter both the closed-in cab and sleeping quarters are heated. Full loads are carried both ways. Finished tires are taken on the eastward trip and tire fabric is picked up for the return trip.

"The present railroad congestion has greatly increased the value of motor trucks, whose work is proving so advantageous as compared with rail shipments. Trucks furnish a striking illustration of the unlimited resources of this mode of transportation in relieving freight shortage, as well as proving the practical worth of roads as a transportation medium over long distances. The greater flexibility of the truck in seeking its own route, and particularly its feature of unbroken freight delivery, direct from shipper to ultimate destination, are striking points of value favoring this form of service.

"But it calls for stamina—both in men and metals. The fast pace requires a truck embodying high-grade workmanship and materials together with exact coordination of its component parts. Mack trucks, due to their smoothness of action and easy flexibility, even under the heaviest loads, have become an essential part of the transportation scheme of this country. Perfect control over tremendous power is shown in the stead Mack performance, representing dynamic force held in leash for the peak of emergency."

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## New Book—Concrete Engineers Handbook

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# Arrangement and Operation of the Canada Cement Company's Plant No. 1

The plants of the Canada Cement Company, Limited, are numbered from east to west, hence the plant described in this article, which is the farthest east, is designated as Plant No. 1. The original plant was built in 1907 by the Lakefield Portland Cement Company, and, together with Plants No. 2 to No. 10 inclusive, passed into the hands of the Canada Cement Company, Limited, in 1909. Since that time additional property has been acquired and extensive additions have been made to the plant, increasing its capacity from 1,200 barrels per day to a capacity of 12,000 barrels per day.

The property is situated about nine miles east of the centre of Montreal, on the north bank of the St. Lawrence River. At the foot of the company's property, the Harbor Commissioners of Montreal are now building a concrete dock five hundred feet long, which, when completed, will be leased to the company and will provide facilities for receiving coal on the site of the plant, and for shipping cement direct by water to the ports of the Maritime Provinces and the Great Lakes.

The Canadian Northern Quebec Railway and the Montreal Terminal Railway (electric) cross the property. The former connects with all steam roads entering Montreal, and the latter permits of delivery to all parts of Montreal and its suburbs by street railway flat cars.

The plant is operated on the dry process, coal being used in the kilns. The raw materials are rock and clay, both of which are obtained close to the plant, but the composition of the rock is such that only a very small proportion of clay is required.

The plant is electrically operated throughout, all the larger machines having individual motors and the smaller ones being grouped. The power, which is purchased from the Montreal Light, Heat & Power Company, is delivered at 10,000 volts, 60 cycles, 3 phase, and is transferred to 550 volts for motors and 110 volts for lighting.

Water is supplied from the river by motor-driven turbine pumps. All departments are connected by telephone to the plan office, stores and electric sub-station. There are some six miles of railway track on the property, owned and maintained by the company, upon which both railways operate.

The original plant had a capacity of 1,200 barrels per day. This was first increased to 4,000 barrels, and later to 6,000 barrels per day. The original plant, together with these extensions, is now known as "Mill A." Before "Mill A" was completed a further extension was decided upon, and this extension, which was completed within the past year, is now known as "Mill B." It is arranged as a separate unit of 6,000 barrels capacity, but the kilns are placed alongside the kilns in "Mill A," forming one long kiln department, which is supplied with fuel from a single coal department. Three of the kilns in the centre of the depart-

General View of Canada Cement Co.'s Plant No. 1. Concrete Stock Houses Shown in Foreground.

discharge their clinker to either mill, for the purpose of balancing operations. The raw and clinker grinding departments in "Mill B" are combined in a single unit, and the machines are so arranged that part of them can be used for grinding either raw material or clinker, as required.

The block plan reproduced herewith shows the general arrangement of the plant, its division into mills "A" and "B" and the sequence of operations.

The quarry, which is immediately adjacent to the mill, is at present worked to a depth of about 55 feet. Most of the drilling is done by electrically-operated well drills, but air drills are used on some of the lower benches and for sinking purposes. Three 75-ton steam shovels load rock into standard gauge side-dump cars, which are pulled up inclines to the crushers by electric hoists.

**Rock Crushing, Storage and Drying.**—In "Mill A" the crusher equipment consists of a No. 11 gyratory crusher, followed by two pairs of 54-in. x 24-in. crushing rolls. The crushed rock is delivered by two 24-in. bucket conveyors either to storage or to bins over three 6-ft. x 100-ft. dryers.

In "Mill B" the first crushing is done by a 36-in. x 60-in. Fairmount crusher, which discharges into a 60-in. inclined pan conveyor. This conveyor discharges into a 7 ft. x 19 ft. rotary screen with 2¾-in.

perforations. The tailings are fed to three No. 6 gyratory crushers, the product of which, together with the "fines" from the screen, is delivered to two bucket conveyors, which carry the rock to large concrete bins back of and above the dryers. The capacity of these bins is sufficient for two days' run. This dryer department contains nine 7 ft. 6-in. x 60-in. rotary dryers, each of which is installed directly back of a 9½-ft. x 150-ft. kiln, in such a way that the heat of the gases from the kilns is utilized in the dryers. The dryers discharge the rock into two bucket conveyors, which carry it to the raw mixing department, from which a belt conveyor then carries it to the grinding department.

**Kilns.**—For convenience of inspection, the kiln department will be considered before passing to the new grinding department. The grinding department of "Mill A" will be dealt with later. The kiln equipment consists of four 8 ft. x 110 ft., four 8 ft. x 125 ft. and nine 9 ft. 6 in. x 150 ft. kilns. The first eight of these kilns operate in connection with "Mill A," and the last six with "Mill B." The three kilns in the middle, Nos. 9, 10 and 11, may receive raw material from either "Mill A" or "Mill B," and discharge clinker to "Mill A" storage or to one of the bucket conveyors leading to "Mill B" storage.

Vertical coolers are used in connection with "Mill A" storage, but no coolers are provided for "Mill B" storage, as it has a capacity of 400,000 barrels of clinker, and is divided into two compartments, so that while hot clinker is being dumped into one, the cool clinker is being drawn from the other. Clinker is put into and taken out of all of the storages by means of bucket conveyors.

**Grinding Department "Mill B"**—This department contains both the raw and clinker grinding under one roof. The equipment consists of fifteen No. 85 kominuters and nineteen No. 18 tube mills in parallel rows. The feed bins are placed in a line between them, and the drives for the mills project through the walls into motor sheds on the outside. Five kominuters and five tube mills in the middle have their feed and discharge conveyors so arranged that they can be utilized on either material.

The rock and clay mixture is brought from the mixing department by belt conveyors, with a tripper for discharging into the kominuter bins. Clinker is brought from the bucket conveyors of the storage by a 24-in. belt conveyor to a mixing tower, where the gypsum is added. From the bins in the mixing tower a 24-in. belt with a tripper carries the clinker to the bins over the clinker grinding kominuters. This belt runs over a weightometer, giving a continuous record of the number of barrels ground.

The material from the kominuters is elevated and fed to the corresponding tube mills, from which the raw material is carried by a belt conveyor to the kiln department, and the finished cement by a belt conveyor to the stock house.

A gypsum storage with a capacity sufficient for five months' run is provided in connection with "Mill B." The gypsum is put into and taken out of this storage by an 18-in. bucket conveyor. In taking gypsum out of storage the bucket conveyor discharges on to a belt conveyor, which carries the gypsum to the mixing tower, where it is added to the clinker.

**Stock Houses Nos. 3 to 6**—Owing to the long winter season, with its necessarily small demand for cement, the output for practically the entire year must be shipped in about seven months. This requires large storage and packing capacity. To meet these conditions, the company has evolved a type of stock house which is particularly satisfactory from the standpoints of convenience, capacity and design. Stock Houses Nos. 3, 4, 5 and 6 are of this type. They are 100 ft. x 200 ft. x 50 ft. high to top of walls, with the exception of No. 3, which was constructed first, and is only 40 ft. in height.

Each stock house is made up of a row of 20-ft. square bins around the four sides, enclosing a central storage 60 ft. x 160 ft. The walls are of reinforced concrete and the roof construction of steel. The bins are filled by a 24-in. belt conveyor with a tripper in the monitor. Cement is drawn out by 16-in. screw conveyors in cross tunnels beneath the floor, spaced 20 ft. centres. These discharge to a 30-in. belt conveyor, running longitudinally in an alley, just outside the foundation. Spouts in the floor, above the screw conveyors, allow for drawing from any of the small side bins or from the central storage. When filled to capacity, each stock house holds about 300,000 bbls.

**Stock Houses Nos. 1 and 2**—Stock Houses Nos. 1 and 2 are of reinforced concrete with buttressed walls. They also have screw conveyors beneath, spaced 20 ft. centres, discharging to a belt along the front. Their capacity is about 120,000 bbls. each.

**Distribution of Production**—The distribution of cement to these storages is as follows: "Mill A" discharges to Stock Houses Nos. 1 and 2 in one direction and to No. 3 in the other, by inclined belts. "Mill B" discharges by an inclined belt to Stock House No. 4 and by a transfer belt to No. 6. Both No. 3 and No. 6 can also transfer to No. 5 as an overflow from either "Mill A" or "Mill B."

**Pack Houses**—The consideration of having to ship somewhat more than double the daily production, during certain periods of the summer season, requires an abnormal packing equipment. The present arrangement allows for the installing of twenty-four Bates machines in Pack House No. 1 and six in No. 2.

Pack House No. 1 draws cement from Stock Houses Nos. 3, 4, 5 and 6. The discharge belts of these deliver to either of two 36-in. inclined belts leading to the distributing tower in the middle of the pack house. The cement from each belt is passed through a rotary screen and on to another 36-in. belt, at right angles, filling the bins of one-half of the building.

The building consists of a series of packing sections. Each section is separated from its neighbor by two railroad tracks running through at right angles to the depending upon delays due to the shunting of cars or the whole. A double bin, in each section, supplies two Bates machines. The filled bags need to be trucked only a few feet to reach the cars on either side. This permits of using one machine to either track, two machines to one track or one machine to two tracks, depending upon delays due to the shunting of cars or repairs to machines.

The conveyor bridge has two floors. The upper floor is for the conveyor and the lower, a through runway, is used for distributing bags to the machines without interfering with machine operation or the shunting of cars. Beneath the buildings is a screw conveyor, in a tunnel, gathering the drip from the packing machines. This runs from both sides to an elevator in the central distributing tower. Here it is mixed with the incoming cement and again passed through the screens.

**Bag Cleaning and Storage**—The Bag Cleaning and Storage Building connects with the distributing runway of Pack House No. 1 at its southern end. One portion has two floors. The lower floor is for the counting and cleaning of returned bags and is equipped with four large bag rumblers. The upper floor is for repairing and tying. Tied bags are bound together in

bundles of 100 and placed in the storage section, so as to be available for the machines at any time. This has a capacity of about 2,000,000 tied bags.

**Pack House No. 2**—Pack House No. 2 draws cement from Stock Houses No. 1 and No. 2 and is similar in construction to Pack House No. 1, except that it has only one track between each section. It is used largely for shipments by street railway.

**Grinding Department, "Mill A"**—Returning to "Mill A," the raw grinding equipment consists of 16 Bonnot pulverizers. Clinker grinding is done by 14 ball mills, followed by 16 tube mills. The clinker storage has a capacity of 100,000 bbls. and is served by two bucket conveyors. These conveyors carry both the clinker and the gypsum to large overhead bins, from which they are drawn in the proper proportions into a small car. The car is then hauled by an electric hoist and is discharged into the bins over the ball mills.

**Coal Department**—The Coal Mill is located northeast of the Kiln Building and connected with it by a screw conveyor, running over the line of coal tanks in front of the kilns. Its equipment consists of six indirect driers, two kominuters, and six 5 ft. x 10 ft. tube mills. Beyond it is a large open storage. Two gravity elevators receive the coal from a track hopper, delivering either to the dryer bin belt or to a belt in the bridge over the storage. This bridge is 500 ft. long. A similar belt, in a tunnel beneath, returns the coal to the elevators, which discharge it to the dryer bin belt.

**Coal Unloading Dock**—The dock now under construction will be equipped with an electrically-operated coal unloading bridge over 400 ft. long, having a handling capacity of 200 tons per hour, and providing a storage for 200,000 tons. The same machinery will reclaim from storage and load into cars for haulage to the plant.

**Laboratories and Shops**—Fully equipped laboratories occupy a portion of the Office Building, in which continuous tests are made of the raw materials and finished cement. The Stores are located just east of Clinker Storage "A." Adjoining them are the Machine Shop and Blacksmith Shop. These, together with the Carpenter Shop, make it possible to do all ordinary repair work promptly.

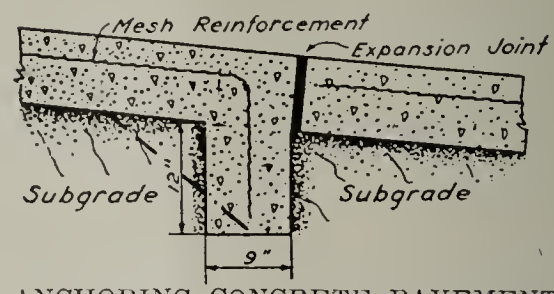
## Concrete Roads on Steep Grades

On both city streets and country highways it is generally very desirable to keep the grades below a limit of five per cent, where possible, but there are sections of the country and conditions of topography where a higher limiting grade must be permitted on some roads. On steep grades, water-bound macadam is found to wear so badly that some other construction is desirable. On the other hand, on the steeper grades the smoother pavements, such as those formed by the use of bituminous binders, are found to be too slippery, especially for horse-drawn traffic. Some counties have used granite block on steep grades, more to obtain a pavement that would not be too slippery for such grades than because the maximum wearing quality was desired.

Until quite recently New York State had limited its use of concrete pavements to five per cent grades, but it is now building them on grades as high as eight or nine per cent, under certain conditions. They consider it especially adapted to grades where there is heavy motor truck traffic. With any kind of traffic, however, on steep grades it is thought desirable to secure a fairly rough surface, and in order to obtain this, as little floating as possible is employed, since the result of excessive floating is to work all the coarse particles beneath the surface. In addition to this, the surface is broomed, which adds to the roughness and gives tires a better grip on the pavement. It is not believed that scoring or marking the pavement for this purpose gives a result which is commensurate with the cost.

Also the use of coarse sand is recommended. Gravel is not generally desirable as an aggregate on steep grades, but where it must be used it should be crushed so that at least half of the particles are broken. If care is taken in selection of the aggregate, in permitting the coarse particles to remain at the finished surface, and in lightly brooming the surface, such a pavement is found to be no more slippery than newly-laid grouted granite block.

One difficulty experienced in laying pavement on steep grades is the tendency of the pavement to move down hill bodily, or for one slab to climb over the




ANCHORING CONCRETE PAVEMENT ON STEEP GRADE.

next lower one at the joint if the joint is not exactly perpendicular to the surface, or even to crush it at this point if the concrete is lacking in strength. In order to avoid this, H. Eltinge Breed, first deputy commissioner of New York State highways, has designed a joint which is now being tried out in work in that state, the idea of which is to anchor each slab to the subgrade at its lower edge so as to prevent its downhill sliding. The illustration shows a cross-section of the lower edge of a slab so anchored. In this case, the anchoring projection would fail of its purpose if the sliding force were sufficient to shear it off along the line of the bottom of the slab. We would suggest that the length and consequently the strength of the line of shear might be advantageously increased by making the up-hill face of the projection inclined rather than vertical, making the projection wedge-shape and increasing the length of its base two or three times, with a comparatively small increase in the amount of concrete used. Such modification is indicated by the dotted line.

## News Items

Humboldt Gravel & Tile Co., Floyd Goodrick, Secretary, Humboldt, Iowa, recently incorporated with a capital stock of $200,000.

The Ensign-Bickford Company, of Simmsbury, Conn., has issued a practical pamphlet for blasting foremen. There are excellent pictures of notable blasts, instructions as to locating holes, handling explosives, etc. Diagrams of hole spacing to suit varied quarry conditions are a feature.

E. J. Krause, of the Columbia Quarry Company, St. Louis, Mo.; J. J. Sullivan, of Doles & Shepard Company, Chicago, Ill., and A. J. Sullivan, United States Crushed Stone Company, Chicago, are president, vice-president and treasurer, respectively, of the Illinois Crushed Stone Association, elected at the Chicago meeting, June 26.

The Cement Products Co. of Spencer, Iowa, was recently incorporated with a capital stock of $750,000. J. J. Hammer, President, and J. J. Radford, Secretary-Treasurer.

# Development of Concrete Barge and Ship Construction

By J. E. Freeman,* Chicago, Ill.

The need of ships has become increasingly evident to all, and that their construction in large numbers is a vital part of our war program is thoroughly understood. Judge George Gray, of Wilmington, Del., a member of the War Shipping Committee of the Chamber of Commerce of the United States, said recently in a plea addressed to the shipbuilders of the country: "There is no exaggeration in the statement that the necessity for an adequate production of ships is the most serious matter that now confronts us in this, the greatest crisis in our country's history, or in the history of the world. We have entered this war for a just cause, and we must prosecute it with all our might and with all the resources of our country. Otherwise we cannot win it."

But speed is essential in securing tonnage, not only to replace submarine sinkings but to provide the great fleet of vessels to transport and maintain an adequate army in the field and still continue to keep our allies supplied with certain necessities. We need this fleet in the quickest possible time. "Make a bridge of ships to France" is the latest message from General Pershing and his men.

The tonnage of steel and wooden vessels now under construction in countless yards, to which are added ships transferred from coastwise and Great Lakes service, is still short of what is needed. To solve the problem requires the rapid development of all methods of shipbuilding, and it is for this purpose that reinforced concrete is now being considered and utilized to augment the tonnage under construction. The first seagoing vessel of concrete has made successful trial trips and vessels of larger tonnage are under construction both here and abroad.

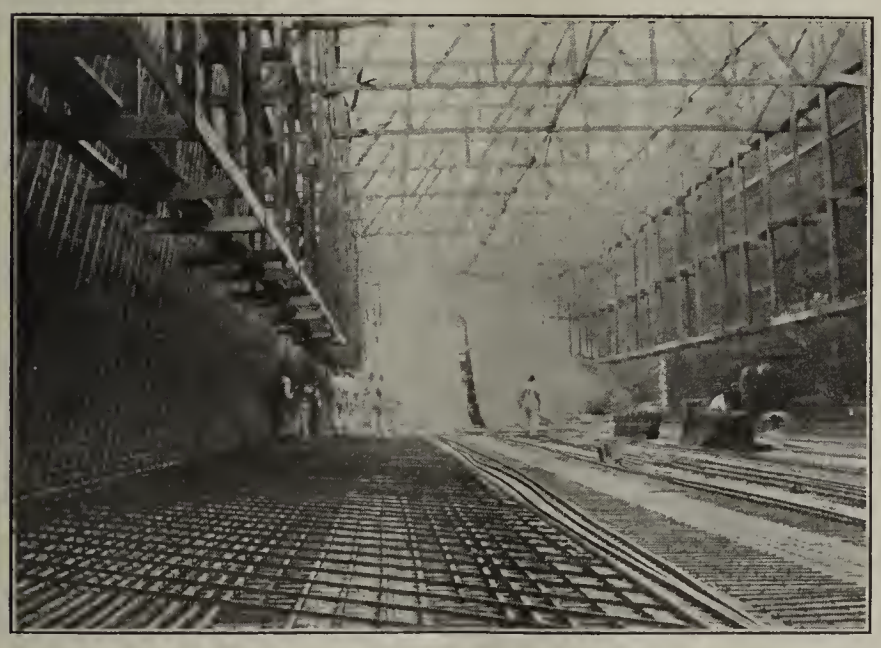
The concrete-ship construction now under way in this country is of course largely experimental, assisted by experience gained in the design of steel and wooden ships; but there is every indication of ultimate success, and, as has been the case in other applications of concrete to new uses, experience with these first vessels will provide data to improve and clarify present ideas and to develop efficient methods of design and construction. Those who have thus far worked out designs for concrete ships have done so more or less independently, and up to the present time only meager information has been published regarding the data and calculations upon which their designs are based. But recent advices show that the Government is studying the problem, that a Department of Concrete Ship Construction has been formed by the Shipping Board, which is actively engaged in the development of a standard design for a concrete cargo ship of 3500 tons capacity, and drawings and specifications are expected to be ready in March. Provisional contracts have also been let to three companies for a number of 3500-ton vessels, plans and specifications for which must be approved by the Shipping Board. This has already been described in the technical press.

This present discussion of concrete ships and barges therefore must of necessity be rather general, presenting a brief review of progress in concrete-boat building from its earliest inception, describing some of the interesting work under way at the present time, and calling attention to the various problems entering into the application of reinforced concrete to such construction.

Singularly enough, boat building furnished one of the first uses of what would today be called reinforced concrete—a rowboat was built of this material in 1849, by M. Lambot, of Carces, France. This instance thus marked the starting point not only of concrete-boat building, but also of modern reinforced-concrete construction. This boat created considerable interest when exhibited by its builder at the World's Fair in Paris in 1855, and it was still apparently in excellent condition as late as 1903. Records are lacking, however, of any further development in France, until 1900, when a gravel barge 50 ft. long, 13 ft. wide and 3 ft. deep was built on the River Lozere.

In 1899 Carlo Gabellini, of Rome, began the construction of concrete barges and scows in Italy, and in 1905 a 150-ton barge was constructed for the city of Civita Vecchia. Later another barge was built for the use of the Italian Navy at Spezia; before acceptance, this barge was put to the severe test of being driven against piling and afterward being rammed by a steel tugboat. Up to 1912 about eighty vessels had been constructed by the Gabellini concern.

Beginning as early as 1887 small concrete barges of 11 tons capacity were built successfully by the Fabrieck van Cement-Ijzer Werken, in Holland, followed later by larger craft of 55 tons capacity with a cellular construction formed by longitudinal and transverse partitions or bulkheads and reported as making the boat practically unsinkable.



**Center to Stern of Reinforced Concrete Boat, Under Construction at Redwood City, Calif.**

**Launching the 200-Ton Seagoing Concrete Motorship Namsenfjord at Moss, Norway, July, 1917. Concrete Floating Drydock in Background.**

*Portland Cement Association.

Abstract of paper presented at a meeting of the Engineering Society of Buffalo, February 13, 1918.

In Germany a 220-ton concrete freighter was built in 1909. The major portion of the hull had parallel sides, but was so shaped that the lines were fairly good and the water resistance was decreased below that of a rectangular barge. This vessel also had watertight bulkheads. It is reported that since 1914 Germany has built numerous concrete barges and some concrete ships.

In 1912 a reinforced-concrete scow or pontoon was built by the Yorkshire Hennebique Contracting Co., Ltd., of Leeds, England, for maintenance work on the Manchester Ship Canal, in accordance with the requirements of the canal company's engineers. The craft is 100 ft. by 28 ft. by 8 ft. 6 in. deep from main deck to keel, drawing about 6 ft. 6 in. when loaded to capacity (about 224 tons). It carries centrifugal pumps, steam winches, engines, boiler and coal supply. The hull consists of a series of watertight compartments, so designed that if the exterior shell were destroyed the body of the hull would still remain afloat. The compartment containing the boiler plant has a 4-in. floor and heavy beams supporting coal bunkers and boiler, but otherwise the general construction is light; the outer skin of the hull is only 3 in. thick. All watertight compartments were carefully tested by filling them with water. The scow has been in almost constant service since construction with small expense for repairs.

In 1910 the building of concrete barges was undertaken on this side of the Atlantic. On the Welland Canal an 80-ft. barge of 200 tons capacity, called the Pioneer, was built for maintenance work. Design and construction were carried out under the supervision of J. L. Weller, St. Catharines, Ont., engineer in charge of the canal work. The barge has a beam of 24 ft. and depth of 7 ft., with rounded bow and a square stern. The hull was divided into eight compartments by longitudinal and cross bulkheads, double hatchways at stern and openings through the cross bulkheads giving access to all parts. The deck, bottom, sides and bulkheads are 2½ in. thick, reinforced in two directions with ¼-in. steel wire and strengthened by the bulkheads and by beams and posts of reinforced concrete about 6 by 8 in. in size. Two 6 by 8-in. oak timbers serve as fenders. The barge draws 2 ft. 8 in. light (130 tons displacement), and when loaded to capacity has a draft of 6 ft.

This barge has been in almost constant service since construction with practically no maintenance charges and is still in excellent condition. At times she has been loaded with 10-ton carloads of rubble stone dumped from a height of 12 to 15 ft. directly on to the 2½ in. deck, the full load starting at one end.

On the Panama Canal three concrete barges 64 ft. long, 24 ft. beam and 5 ft. 8 in. deep were built in 1910 to carry dredging pumps, forming part of a plant used for hydraulic excavation at the site of the Miraflores locks. They were launched in the spring and summer of that year. Reinforced concrete was used because it was impossible to obtain skilled labor and suitable material for the construction of steel or wood barges within the time required. The walls and bottom were made 2½ in. thick—two 3 in. bulkheads extending from bow to stern, making three compartments. Longitudinal beams at top and bottom of bulkheads and side walls, with posts at 10 ft. intervals, cross-connected at posts by beams with knee braces, comprised the general framing plan. The shell was a 1:2 mortar plastered on the steel skeleton of rods and mesh. Interior members were 1:2:4 concrete cast in forms. The draft was 3 ft. 5 in. with a total load of about 140 tons.

Following this work, in 1913 and 1916 a number of reinforced-concrete pontoons were built at Panama to serve as landing stages for boats up to 65 ft. in length, and have been in regular use since. These pontoons are 120 ft. long, 28 ft. wide and 8 ft. deep.

Oscar F. Lackey, when harbor engineer at Baltimore, developed a system of construction which was first used in 1909 to build a landing stage for small boats, and then in 1912 was applied to building a 500-ton concrete gravel scow for the Arundel Sand and Gravel Company of that city.

This latter craft has a length of 113 ft., a breadth of 29 ft. and a depth of 10 ft. 6 in. Four longitudinal bulkheads and five cross bulkheads divide it into twenty watertight compartments. The shell and deck are supported by a series of vertical and horizontal beams, the slabs varying from 3 in. to 5 in. in thickness, reinforced with plain bars running in both directions. The hull was built between forms and a very rich concrete mixture was used, with coarse aggregate of about ½-in. maximum size. With the intention of facilitating towing, the sides were rounded on about a 6-ft. radius and worked into sloping ends which were carried back much further than in the ordinary scow. Light, the scow draws 4 ft. 3 in., and when loaded to its capacity has 1 ft. freeboard.

This scow has been in daily use ever since construction, is perfectly watertight and has withstood the roughest kind of handling. It has required no pumping out.

The full-rounded sides and ends developed some undesirable features under load in a high sea or strong wind and in berthing. Consequently, in two other scows that were built in 1913 and 1915, respectively, a design more along the lines of the ordinary wood scow was utilized. These later scows were also cheaper to construct, form work being less expensive and placing of reinforcement easier. In the second of these scows five longitudinal and five cross bulkheads were used, and a combination of bars and expanded metal used for reinforcement. In the third scow an intermediate deck was introduced. The difficulties found in towing the first scow were eliminated and the draft reduced to 3 ft. 10 in. This was slightly in excess of a timber scow of the same capacity, but the concrete scow towed as easily when new, according to Mr. Lackey, and more easily than the other after a few months' service because of the lack of formation on the bottom.

One of these scows is used by the Raymond Concrete Pile Co., at Baltimore, a letter from which company last July stated that it had been very satisfactory in every respect and there had not been a dollar's worth of repairs since the scow was placed in commission.

Considering that these scows are watertight, do not require scraping, calking or painting, or maintenance other than repairs to the wooden-fender system, and crediting the cost of time that would otherwise be lost in making such repairs, the concrete scow becomes a decidedly interesting proposition.

England and France have recognized the utility of barges and self-propelled lighters of concrete. Last spring an English periodical mentioned a French company formed for the purpose of building sea-going concrete lighters; later pictures were shown of concrete boats under construction on the Paris Ship Canal. The Under Secretary for Sea Transportation and Merchant Marine in France was recently quoted as saying that very interesting experiments had been made with two concrete lighters in service. This has doubtless led to the building of more craft near Bordeaux, also several twin-screw vessels at Ivry-on-Seine, recent press photographs of which give a general idea though

details are lacking. An English paper reports orders on hand from the French Government for several hundred concrete barges. Several English firms have begun the building of motor-driven barges of concrete, and more recently a concrete shipbuilding company has arranged for a yard at Dundee, Scotland.

James Pollock & Sons Company, a London firm of naval architects and engineers, has drawn plans for a fleet of small coasting vessels of reinforced concrete, the first vessel laid down having a length of 92 ft., beam 19 ft. and depth 10 ft. Power is obtained from a 120-hp. oil motor. In coasting vessels which need not make over 8 miles per hour, the use of straight lines would not necessarily be a handicap, and these concrete vessels have therefore been designed with such lines wherever possible to reduce form work, simplify bending, placing of reinforcement, etc. This firm is now drawing plans for larger vessels of 500 to 1500 tons cargo capacity.

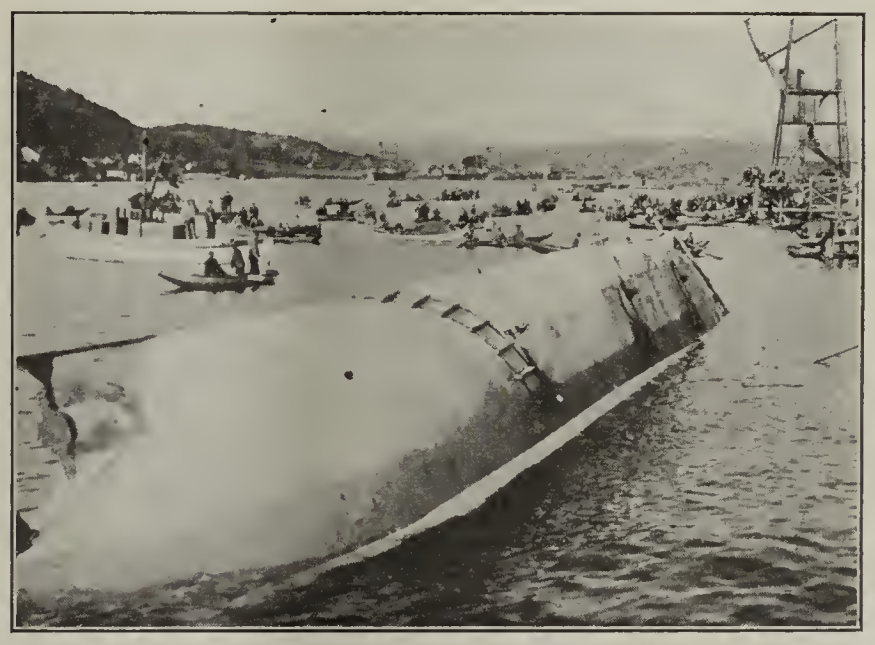
A letter just received from a former Chicago engineer, now in England, advises that he has recently designed a number of barges and sea-going vessels of reinforced concrete and is at present interested in the building of ten such sea-going barges of 1000 tons capacity. A recent statement by the First Lord of the Admiralty that ferro-concrete barges up to 1000 tons were being built in Great Britain possibly refers to this same work.

Construction of Concrete Cargo Steamer at Barcelona, Spain.

A Spanish reinforced-concrete cargo boat will be launched shortly by a corporation known as Works and Pavements, of Barcelona, the first firm in Spain to engage in the construction of concrete ships. The length of the first vessel is about 110 ft., beam 23 ft. and depth 11½ ft. Power will be supplied by a 120-hp. Diesel engine, and in addition sails will be fitted to the vessel. The company plans to construct during 1918 a gross tonnage of 40,000 in standard ships of 300, 500 and 1000 tons each, while ground has been acquired to permit later the construction of thirty boats at a time, some of which are planned to be of 6000 tons capacity. This company uses a mixture of 650 kg. of cement to 1 cu. m. (1:2½) of inert materials (gravel and sand of three sizes) so as to obtain, in its own words, "a dense, impermeable mixture that will permit also constructing the thinnest permissible section with a view to reducing maximum weight and thus obtaining the greatest possibilities in the way of speed." The concrete is considered to develop a compressive strength of 271 kg. per sq. cm. (approximately 3800 lb. per sq. in.) in 90 days, and a working strength of 76 kg. (approximately 1100 lb. per sq. in.) has been adopted.

Yet this work in shipbuilding is not entirely new, for Norwegian and Danish firms have already built and launched several concrete ships and self-propelled lighters of 200 tons capacity and now have larger craft under construction. The Fougner Steel-concrete Shipbuilding Company, one of the first in the field, has a plant at Moss, established in 1916. Following successful experiments made by Mr. Nic. K. Fougner with a 50-ton concrete lighter at Manila in 1914, the company has built some eighteen or twenty reinforced-concrete lighters and tow boats. These lighters have capacities of 100 to 200 tons, the later types having more the barge shape. Some are in use along the Norwegian coast and others have been bought by the Norwegian Navy. A loading test recently reported of a 64-ft. 100-ton lighter over an unsupported length of 40 ft. showed a deflection of about 0.6 in. under a uniform load of 16 tons, in addition to the weight of the lighter itself which was 58 tons. The surface is reported to have shown no sign of cracking or indication of flaws.

The structure consisted mainly of keelson and ribs of reinforced concrete with a thin shell of concrete plastered on expanded metal or cast around rods, and this method of construction has been applied to the first sea-going concrete ship, the *Namsenfjord*. This



Launching a 200-Ton Concrete Lighter at Porsgrund, Norway, July, 1917.

vessel was launched last summer, was given a high rating by Lloyd's and is now in service for coastwise traffic. The vessel has a cargo capacity of 200 tons on 9½-ft. draft and is driven by a Bolinder crude-oil engine of 80 hp. at a speed of about 7½ knots. The length is 84 ft., beam 24 ft., molded depth 11½ ft. Larger ships of 600 to 1600 tons are now building, but their general design is much the same as that of the *Namsenfjord*, briefly described as follows:

There is a keelson of reinforced concrete with cross frames every 4 ft., the frames being continuous along sides and bottom and tied to the keel by the rod reinforcing. Particular attention is paid to continuity of reinforcement for these frames, and knee braces are provided at corners of the hull. The skin is 3 in. thick, reinforced with mesh and having a longitudinal beam at the outer corners of the hull. Concrete-filled pipes are used for center posts at intervals. The hull is divided into watertight compartments by transverse bulkheads of concrete reinforced with metal lath. The cabin is of wood and wood fenders are provided.

In building the hull, the bottom is cast in forms up to the top of the longitudinal hull beam previously mentioned. For the size of this vessel the reinforcement and metal lath is set up for the total height and concrete deposited between the two sets of lath which

act as a form; the outside and inside surfaces are then plastered. For larger boats this procedure is altered, using shorter heights of lath or casting the main frames in forms. Care is taken to make the construction continuous, however, so that no joints are left in surfaces exposed to water.

In the earlier craft 1:1½:2 or 1:1½:2½ concrete was used with ½-in. maximum size aggregates, but later developments showed a 1:2 mixture with ¼-in. material worked better around the reinforcement.

The company has a contract for a 4000-ton ore carrier 254 by 40 by 19½ ft., equipped with two 300-hp. Diesel engines, and only awaits authorization by the Norwegian Marine Registry before proceeding with the construction. It has also constructed for a Christiania firm of yacht builders a floating dry-dock of concrete—the first of its kind—with a lifting capacity of about 100 tons, which suggests another field for development in the present emergency. The dock is 80 ft. long, 38 ft. wide and 20 ft. high, with a sill 4½ ft. thick and side walls 6½ ft. wide at the bottom. There are nine watertight compartments. The dock accommodates a vessel 75 ft. by 25 ft. and is equipped with an electrically operated centrifugal pump by means of which a 100-ton load can be lifted from the water in one hour. The Fougner Company is reported to have plans for larger docks up to 15,000 tons capacity.

**Launching a 200-Ton Concrete Lighter at Porsgrund, Norway, July, 1917.**

The ships built according to the Fougner system have a ratio of dead weight to displacement from 12 to 15 per cent less than for steel ships, that is, their displacement is more for the same cargo-carrying capacity. [By dead weight is meant the cargo-carrying capacity expressed in tons, usually in terms of long tons (2240 lbs.). The displacement of a ship is the weight of water she displaces, and covers the weight of the ship itself plus the dead weight.]

The Fougner Company has established an American branch in New York, and is reported to have a contract with the Shipping Board for several 3500-ton ships contingent upon the success of the first vessel. It is stated that the Ferro-Concrete Shipbuilding Corporation, of New York, and the Liberty Shipbuilding Company, of Boston, also have similar contracts.

Another Norwegian company actively engaged in concrete-boat building is the Porsgrund Cement Construction Works, at Porsgrund. After the construction of a bridge pontoon in 1913, experiments were begun with a view to simplifying the form work and construction methods, as a result of which it was determined to build the boats upside down and launch them in that position. Following successful experiments with a 9-ft. model, a 200-ton barge was built and launched last summer. The barge has a length of 98½ ft., beam 19½ ft. and molded depth of from 9 ft. at center to about 10½ ft. at bow and stern. It will be equipped with a 70-hp. motor. Other lighters are in process of construction having capacities of 600 to 1000 tons. The general design follows that of a framed steel ship. The righting of the boat took about 20 minutes, an ingenious arrangement of inner airtight compartments making the craft practically self-righting.

The principle may be briefly described as follows: The inner mold is divided into compartments; when the vessel enters the water the air gradually escapes from the middle and upper two compartments through vent pipes, and the vessel losing buoyancy gradually sinks to a point of maximum submergence. The lower side compartments never being flooded, the vessel is in a state of unstable equilibrium, the center of gravity being considerably higher than the center of buoyancy. If the vessel now heels slightly to one side or the other, a couple is formed, the moment of which tends to turn the vessel on a longitudinal axis until the vessel is righted and floats in correct position. The flooded compartments are then pumped out and the molds removed to be used again for a similar vessel.

Progress in concrete shipbuilding has been made in Denmark also: one firm is reported to have several types from 300 to 1000 tons dead weight approved and classified by the Bureau Veritas for overseas service. The work has even developed so far that official rules have been laid down for design applying to the construction of flat-bottomed vessels of reinforced concrete.

At Montreal, Canada, the construction of a 126-ft. ship of about 350 tons capacity was started early in September, 1917, by the Atlas Construction Company, Ltd., and the vessel launched in November. This ship has a beam of 22½ ft. and a depth of 12½ ft. The ribs are of structural steel encased in concrete and spaced about 27 in. apart, the steel sections being 5 in. deep at the top and 14 in. at the base. Before the plans were prepared by C. M. Morssen, president of the company, and Prof. Ernest Brown, of McGill University, tests on model ship beams were made to ascertain the resistance of concrete to some of the strains encountered in ship design. The shell is of reinforced concrete varying from 3½ to 5 in. in thickness, approximately 50 tons of reinforcing steel being used in construction. The concrete is reported to be practically a mortar, about 1:1½:1, with small gravel. It was placed between forms, construction being carried on as continuously as possible. The vessel is of the single-screw type capable of about 8 knots.

The concrete vessel to which probably the greatest interest attaches at present is a 336-ft. single-screw cargo steamship of about 5000 tons capacity being built at Redwood City, near San Francisco, by the San Francisco Shipbuilding Company. The ship has a beam of 44½ ft. and a molded depth of 30 ft., with a designed load draft of 24 ft. She is to be fitted with Scotch boilers and triple-expansion engines of 1750 hp., giving a speed of 10 knots. Fuel-oil tankage is provided sufficient for 30 days' steaming.

The hull is divided into nine watertight compartments by concrete bulkheads. The frames or ribs of the hull are spaced about 4 ft. apart and there are also interior columns for the support of the two decks. The shell is reported to be about 5 in. thick at the bottom, decreasing to 4 in. at the deck, which is about 3½ in. thick. In addition to the diagonal-rod reinforcement

in the shell, wire fabric is placed ¾ in. from the outside surface.

According to recent reports concrete is now being deposited in the forms, using a 1:1½:2 mixture with ¾-in. maximum size coarse aggregate and carefully graded sand. During the placing of the concrete the outsides of the forms are hammered to thoroughly consolidate the concrete and produce a dense surface. After stripping the forms, the hull is to be sand-blasted and given a coating of gunite, later finished by rubbing[1].

Although several firms in New York City have been developing plans for barges, the first construction work of this character was begun by the Louis L. Brown Company last October on a 700-ton deck scow of length 112 ft., beam 33 ft., depth 10 ft. and light draft 3 ft. 4 in.

The frame of the barge consists of reinforced-concrete members supporting a thin concrete shell reinforced with wire mesh. Rail, bulkheads, and deskhouse are of concrete; wooden fenders will be used. Concrete is placed by means of a cement gun.

Construction of a 500-ton scow will be started shortly at Vancouver, B. C., the plans having been prepared by the Taylor Engineering Company, of that city. This has an overall length of 107 ft., beam 32 ft., and depth 9½ ft. It will draw 3½ ft. light and 8½ ft. when loaded to capacity. The truss method of framing is of interest. The same company is now designing a 1200-ton well-deck scow. A New Orleans sand and gravel company is now building a deck barge 130 by 30 by 7½ ft. deep, of about 550 tons dead weight.

A joint committee of the American Concrete Institute and the Portland Cement Association has been investigating this subject in a preliminary way. It recently prepared a report covering points to be considered in designing concrete vessels and submitted a tentative design for a 2000-ton sea-going barge of the following dimensions:

| | |
|---|---|
| Length | 227 ft. 6 in. |
| Loaded draft | 18 ft. 0 in. |
| Length between perpendiculars | 220 ft. 0 in. |
| Beam | 42 ft. 0 in. |
| Depth | 23 ft. 0 in. |

The displacement was estimated to be 3675 tons on an 18-ft. draft. The vessel is divided into five compartments by transverse bulkheads, the three center compartments being for cargo and the other two for tank and ballast.

In designing the criterion followed was a steel ship designed according to Lloyd's rules, and practically equivalent strength provided in reinforced concrete. A concrete of 1:1:2 mixture with carefully selected sand and selected gravel (about ½-in. size) was decided upon and considered to develop an ultimate crushing strength of at least 3000 lb. per sq. in., allowing a maximum stress in concrete of 1000 lb. per sq. in.

The spacing of the frames is 4 ft. and the thickness of shell 4 in. on the sides and 5 in. on the bottom. Two lines of reinforcement are provided. The deck is 3 in. between hatches and along the lines of the hatches and 5 in. thick outside these lines.

An estimate of quantities gave the following:

| | |
|---|---|
| Concrete | 731 cu. yd. |
| Steel | 482,000 lb. |
| Flooring for hold | 30,000 ft. B. M. |
| Oak timber (fender rail, etc.) | 15,000 ft. B. M. |

The total weight of the ship was estimated to be 1647 tons and the carrying capacity 2028 tons for 18-ft. draft. The cost of the hull per ton dead weight was estimated at $63; the best available figures indicated a cost of steel hull of the same character of $90 to $120 per ton and up; cost of wooden hull of $70 to $100.

A few paragraphs from the report of the joint committee are given below and may be of interest in regard to points connected with the design and construction of concrete vessels.

"It is apparent that the efficiency of a ship as a cargo carrier depends upon the relationship between dead weight and displacement. Expressed in terms of per cent, in the average cargo ship built of steel, the dead weight is from 70 to 75 per cent of the displacement—taking into account as weight of ship all spars, fittings, deck houses, anchors and chains, auxiliary engines and tanks, but not boilers, engines or coal. In a wooden ship, the dead weight is from 60 to 65 per cent of the displacement. It is quite evident that from the difference in weight of materials, it will be difficult to design a ship of concrete that will give a relationship between dead weight and displacement approaching that of steel. However, if ships are to be built of concrete for commercial use, the weight of the ship must be such as to provide a reasonable dead weight or cargo capacity for the displacement.

"The stresses in the transverse members of a ship are, in still water, functions of the draft and the stiffness, and may be computed by mathematical processes, although the computations are long and laborious. When the material is reinforced concrete the problem becomes much more complicated. Experience has shown, however, that numerous elements other than draft affect the transverse strength of a ship, such as the effect of rolling in a sea way, impact with docks or other ships, and stresses incident to going into dry-dock. The transverse members of cargo ships of today are, therefore, not designed to withstand computed stresses, but are designed in accordance with various rules which embody the result of long experience in the construction and use of ships. It should be noted in this connection that granting of insurance depends on compliance with these rules."

"Steel ships are of two different types, (a) framed ships, in which transverse ribs or frames are spaced from 18 to 24 in. on centers, the plating being riveted to these ribs without intermediate longitudinal members, excepting in the bottom; and (b) longitudinally framed ships (Isherwood), in which heavy frames are spaced from 10 to 15 ft. on centers, with intermediate longitudinals to which the plating is riveted."

"From a comparison with the ordinary steel-ship design, it would appear to be not difficult to design transverse members of reinforced concrete of equivalent strength to steel members—the question of strength only being considered."

"A ship must be able to meet conditions which are unlike any to which land structures are subject.

"In determining the longitudinal strength of a ship, it is customary to assume two conditions. Under the first condition, the ship is assumed to be suspended between two wave crests, the length between crests being equal to the length of the ship between perpendiculars, the height of the wave being equal to one-twentieth of that length. In this case, the ship as a whole is acting as a simple beam supported at the ends. This condition is termed 'sagging.' Under the second condition, the ship is assumed to be supported amidships on one crest of the same wave. Under this condition, the ship as a whole acts as a cantilever. This condition is termed 'hogging.' It is apparent, therefore, that when a ship is riding the waves both the deck and the bottom of the ship will be required to withstand tensile and compressive stresses alternately—the maximum tensile stress following the maximum

[1]Since this was written, word has been received that the hull has been completed and the vessel successfully launched.

compressive stress at very short intervals. In a steel ship the entire cross-sectional area of the midship section acts to resist these stresses, taking into account, in determining the moment of inertia, all of the continuous members, such as continuous scantlings and deck, side and bottom plates. In the concrete ship equivalent strength must be provided. In the case of the concrete ship, however, only the steel reinforcement can be relied upon to take tensile stresses. The concrete, assisted by the steel, will take the compressive stresses."

"There is an almost unanimous opinion among naval architects and seafaring men generally that a concrete ship will be so inelastic that she will tear herself to pieces in a sea. While it is doubtless true that in a concrete ship there will not be the same readjustment of stresses as in a steel ship when subject to the action of a heavy sea, experience with reinforced-concrete structures generally has shown that such structures have considerable elasticity, and there is ample reason for the hope that reinforced concrete will prove a suitable material for shipbuilding purposes."

One of the questions in concrete shipbuilding concerns the possible effects of sea water on concrete. Recent investigations by the Bureau of Standards, as reported by Messrs. Wig and Ferguson, throw new light on this subject and point out remedies. The results of their investigations tend to show that inferior concrete, or concrete of which the surface skin has been impaired, suffers serious effects when in contact with sea water, and that great care in the mixing, placing, and finishing of the concrete is needed for durable construction. There is every reason to feel assured that the care needed in the selection and proportioning of materials and in mixing and placing and finishing concrete for concrete shipbuilding will provide the proper remedy.

Another aspect is the protection afforded the reinforcing steel by the concrete, and in this connection the investigations of the Bureau of Standards show that portland cement itself is durable in sea water, which suggests that the rich mixture of concrete used in concrete ships, if properly deposited around the reinforcing steel, will provide the requisite protective coating.

Besides the work now under way which has been mentioned, plans are nearing completion for the construction of other vessels on the Gulf and Southern Atlantic coasts, so that in the course of six months there should be much more detailed information available on the subject. The art of concrete shipbuilding might be said to hold the position occupied by reinforced concrete fifteen years ago, but the knowledge gained during these years is helping to solve the present problems, and we may be sure of a rapid development in this hitherto unrealized field.

## The Manufacture of Concrete Burial Vaults

You don't have to wait until the frost is out of the ground to start manufacturing concrete burial vaults, writes the Automatic Sealing Vault Company, 216 E. River street, Peru, Ind. The best time to start the concrete burial vault business is right now, when outside work is generally tied up on account of weather conditions and you have a chance to get well under way and get a stock of vaults made up for spring business. There is no mystery about the manufacture of burial vaults—it requires the same care exercised in making building blocks. Our machine manufactures vaults of any required size. You simply buy the machine and start turning out a product. You don't have to pay us for anything except the equipment actually needed.

Let us send you a book about the burial vault business. It shows exactly what our machine will do, what people think of the vaults made on it, how to market burial vaults and what manufacturers of Automatic Sealing Vaults are doing all over the country. This book was written partly by our selves and partly by satisfied users of our machines. A copy will be sent you free, on request.

## Suggestions for Reducing Hazards From Falling Rock in Quarrying

The greatest percentage of fatalities in quarry operations, according to a recent bulletin of the U. S. Bureau of Mines, is due to falls or slides of rock and overburden. The following suggestions for reducing these hazards are given in the Bulletin:

**Slides of Overburden**—Where the removal of a heavy covering of soil is necessary, safety demands that two important considerations govern the plan of stripping. (1) Soil is less coherent than rock and can not be safely excavated from a very steep face. The danger of falls or slides may be decreased by avoidance of overhanging or unduly steep walls. The conditions of safety are governed by the nature of the material and by other circumstances. A bank which appears perfectly safe may on account of excessive rain, or if frozen may when thawed, become quite dangerous. (2) The stripped rock surface between the bank and the quarry pit should be wide enough that there is no danger of soil falling or bowlders rolling over the edge of the excavation. Serious accidents have resulted from slides of overburden into the quarry pit. The practice of making stripping walls almost continuous with quarry walls is very dangerous. If the stripped surface is narrow or if it slants toward the excavation in such a manner that there is a possibility of material falling over the edge, a protecting fence should be maintained along the edge of the pit.

**Slides of Rock at the Working Face**—In quarries which produce rock for crushing, lime burning, etc., the hand loading of fragments at the quarry face necessitates certain risks. Where it becomes necessary to work at the base of a steep pile, workmen should always maintain a clear way of escape. It is customary in some quarters for the quarryman to pick out certain qualities and sizes of stone and pile them behind him ready for removal by car. Serious and even fatal accidents have resulted from thus building a barrier which prevents escape when a rock slide takes place.

**Danger Around Waste Heaps**—A similar danger exists around steep waste heaps, especially where a roadway passes close to the heap. Blocks may roll down the steep face and injure men or teams which may be working near by or may be passing along the road. Waste rock should be built in a secure protecting wall on the exposed sides of such heaps.

**Dangers of Bench Quarrying**—Where a quarry is carried downward in a series of steps or benches, especially in quarries for the production of cement, lime or crushed stone, the laborers at the foot of a bench are in constant danger of rock falling from the bench above them. Methods of deep drilling are not only more efficient, but entirely overcome this danger by eliminating the benches. In many quarries drill holes are driven 50, 60, or in some cases over 100 ft. in depth, and the quarry thus worked as a single bench. If a steam shovel can be used on the shattered mass the danger of falling rock at the working face is decidedly decreased.

# Sellar Gravel Washer

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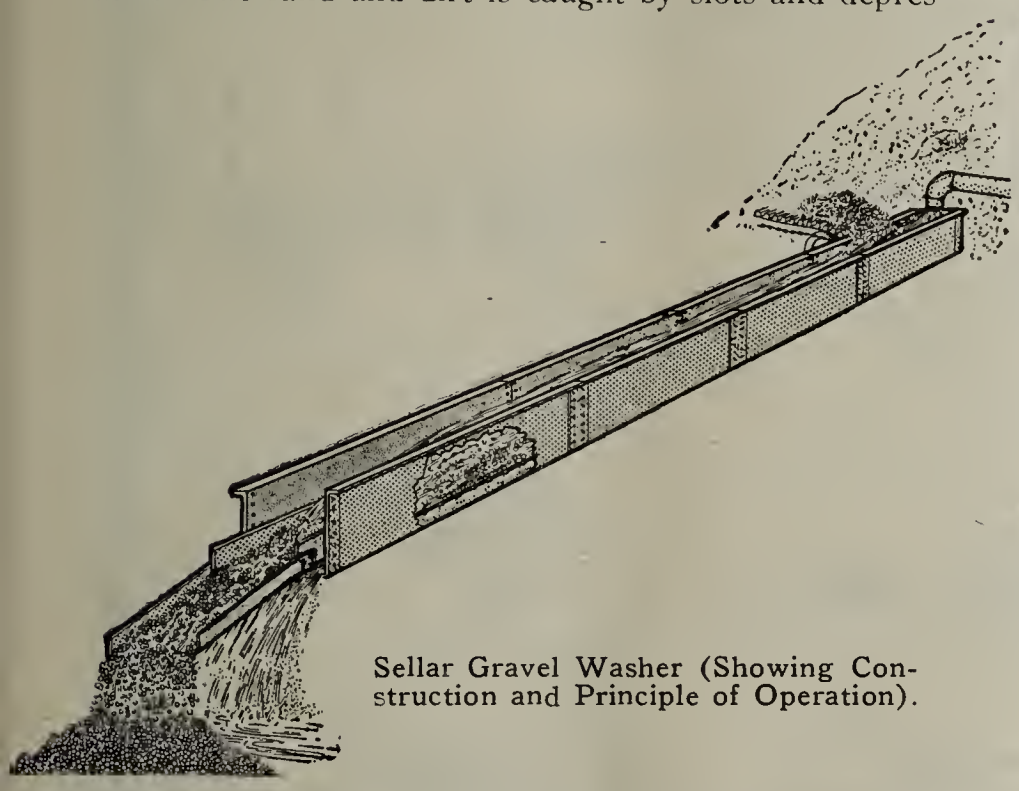
The Sellar gravel washer is a small outfit designed for portability and quick set-up. The first cost is low and the operation is economical. It can be rapidly taken to any gravel source and is especially adapted for use by contractors, county highway officials and city departments.

The Sellar gravel washer consists essentially of strong and rigid steel flume fitted with the Johnson patent perforated metal gravel screen designed to eliminate the possibility of clogging. The flume is set at a slant of about one inch fall per foot, depending on the water supply available. The gravel is put in by conveyor or otherwise at the high end of the flume just below the water supply and is washed down the flume by the volume of water. The sand and dirt is caught by slots and depressions and falls down the screen and is washed out by the flow of water. The gravel is rolled, scoured and washed clean and is discharged into conveyor, sizing screens or other ordinary means of handling it. With the standard screen, all gravel larger than 1/16-inch is cleaned and delivered to the conveyor. The washer is all steel and has no movable parts to break, wear out or give trouble. It is made in standard units eight feet in length and is easy to move from one place to another as conditions at the gravel pit demand. The user can wash his gravel right on the job and save a great deal of teaming and expense.



Sellar Gravel Washer (Showing Construction and Principle of Operation).

The initial cost of the Sellar gravel washer is much less than for the ordinary washer. The fact that gravity furnishes all of the power required is a big economy in operation. The washer is built to last many years, the only expense being occasional renewing of the screens when they wear out. With a water supply of about 400 gallons per minute it is claimed that 100 yards of gravel per day can be washed with one single unit. If a larger output is required, additional units are installed to get the output desired.

The accompanying illustration shows a diagram of the washer. Write CEMENT AND ENGINEERING NEWS, 672 Transportation Bldg., Chicago, for catalog and prices.

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Cement manufacturers are interesting themselves in the food conservation movement through a campaign of education by which, it is pointed out, millions of dollars' worth of fruits and vegetables will be saved for use next winter by storage in concrete cellars which can be built at a comparatively small cost.

The concrete storage cellar is becoming an important adjunct to several of the leading state institutions of Illinois, including the Elgin State Hospital, the State Industrial School for Girls at Geneva, the Joliet prison and several others. The plan is also being considered at the Great Lakes Naval Training Station. Large cellars of this type are being maintained by the Lake Forest University and the Ontwentsia Club at Lake Forest.

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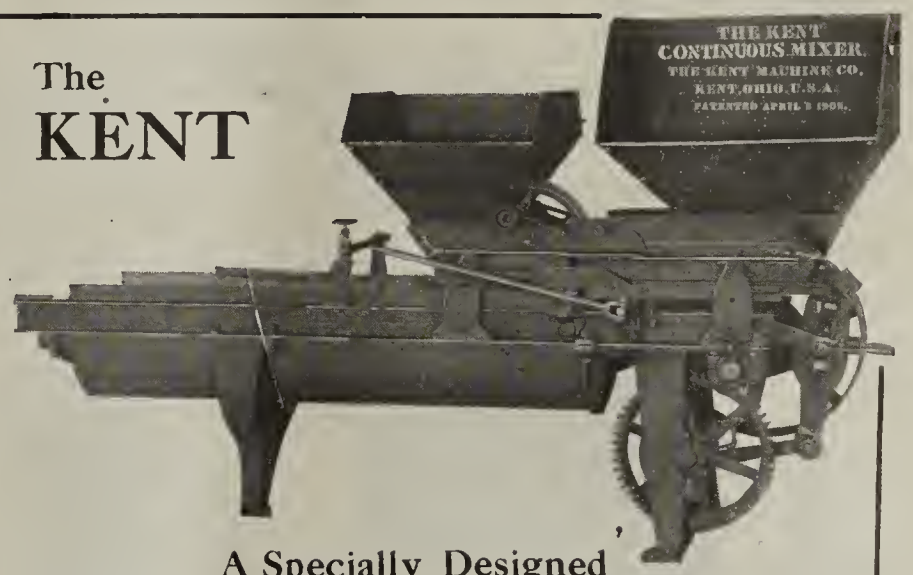


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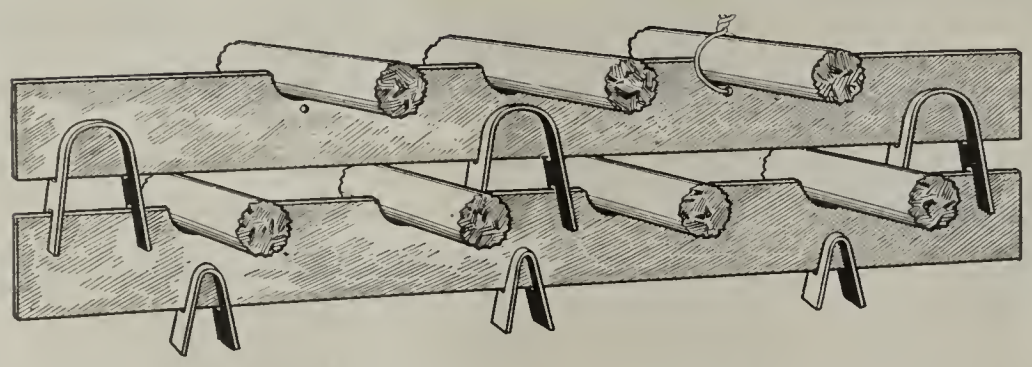
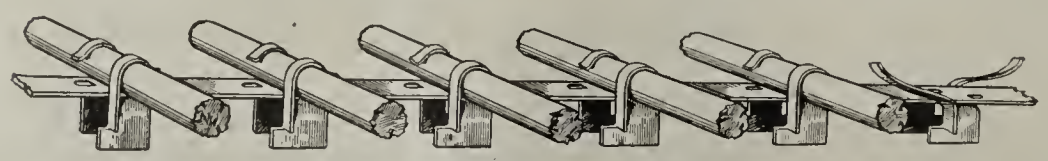


**Universal Beam Saddle.** Made of steel. Can be furnished for any speeified number and size of bars, spaeing and height.



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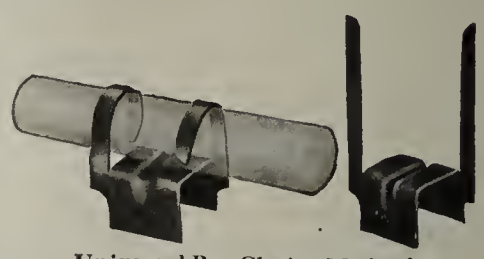
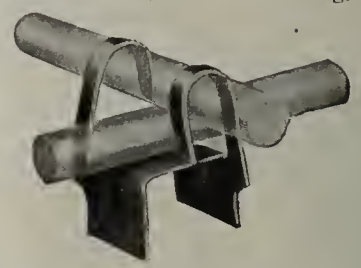
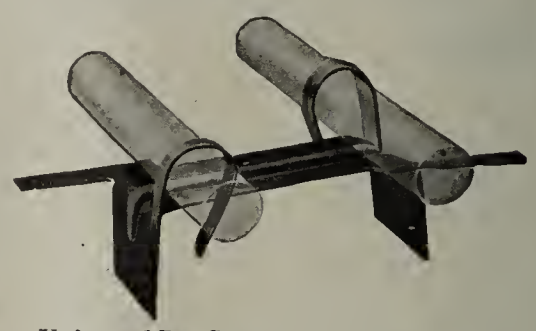


**Universal Bar Chair:** Made of steel. Illustration above shows use with single rod reinforeing.



**Universal Bar Chair.** Same as above. Use for 2-way reinforeing.



**Universal Bar Spaeer.** Similar to Universal Bar Chair. Spaeing, 4 in., 5 in., or 6 in.

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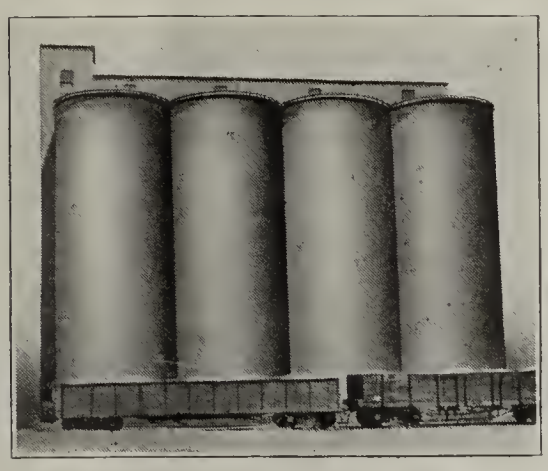

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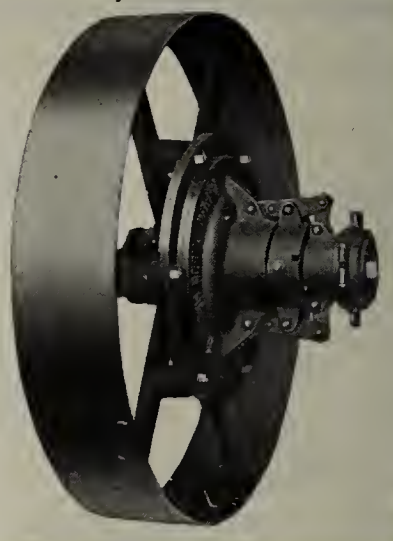

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**Quick Deliveries, Low Prices and First Class Work Our Motto**

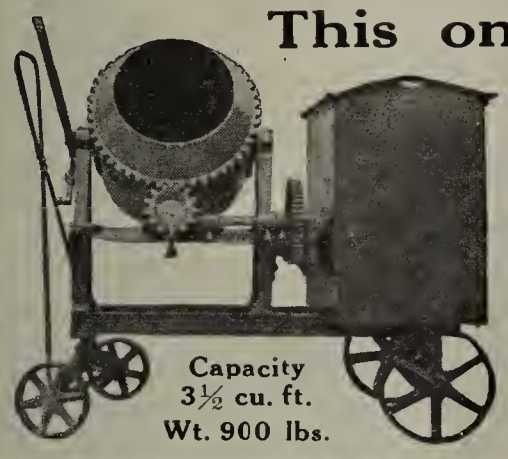
## Foote Bros. Gear & M. Co.

**210 to 220 N. Carpenter St., Chicago**

# REPUBLIC MIXERS

No matter what your mixer requirements are, we can fill them satisfactorily with the best, latest improved machines on terms to suit you. We make mixers from 3½ to 10 cubic feet capacity, both tilting and non-tilting, low charging, power loader, reasonable prices.

## This one $160



Capacity
3½ cu. ft.
Wt. 900 lbs.

Complete, all steel power mixer, including trucks, engine and housing.

Similar machine for hand operation or equipped with belt pulley, $55

*Write for complete mixer catalog*

**REPUBLIC IRON WORKS**
Box 454
Tecumseh, Mich.

# IMMEDIATE DELIVERY

"Franklin"

ROUND—SQUARE—FLAT—SQUARE TWISTED

## STEEL BARS
for CONCRETE REINFORCING

We can meet your Reinforcing Steel Requirements. This means not only quick shipment from the mills but co-operative service for rapid transportation. If you want to know just what your exact cost will be, send us the Blue Prints and we will give you a lump sum bid on all the steel sheared to lengths, bent to specifications and delivered to the job,

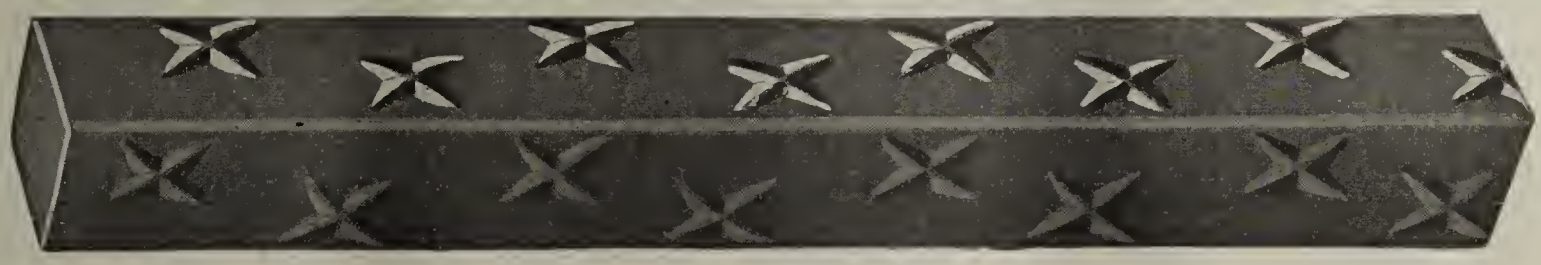
***Our Engineering Department is at your service.***

## The FRANKLIN STEEL WORKS
FRANKLIN, PENNA.

Cleveland, 1320 Rockefeller Bldg.
Boston, - - 12 Pearl Street
Philadelphia. 2215 Race Street
New York, - 30 Church Street
Chicago, - - 332 So. Michigan Blvd.
Buffallo, - Erie County Bank Bldg.
Pittsburgh, Oliver Bldg.

QUALITY SERVICE

# Inland Deformed Bars



In Open Hearth Steel (New Billet Stock), Hard Grade, and Rail Carbon Steel (Rerolled).

The mechanical bond is theoretically correct and is guaranteed by us, having been designed by expert concrete engineers and approved generally by engineers and architects.

The corners are rounded to prevent splitting of the concrete. Bending, fabricating and setting are easily done with these bars. Sizes ⅜ to 1¼ inch. Lengths up to 85 feet.

Prompt shipments during 1918.

**INLAND STEEL COMPANY First National Bank Bldg., CHICAGO**

BECAUSE WE SPECIALIZE ON

## Lock Seam Pipe

with the smooth inside surface, having already furnished large quantities for Potash Recovery plants, we are able to give especially careful attention to the construction of this class of Pipe.

**Robertson Bros. Mfg. Co., Chicago**

## Luten, Roberts & Titus
INDIANAPOLIS

*Designing and Consulting Engineer*

*Reinforced Concrete Bridges Exclusively*

Associate Engineers in each State

# BELTING

"V-B" Balata
"AMPERE"
(Canvas Stitched)
"WHITE SEAL"

Write for Prices, Discounts and Samples

**VICTOR BALATA & TEXTILE BELTING CO.**

Factory: Easton, Pa. Main Office: 38 Murray St., New York
Stores: 167 N. Market St., Chicago, and 87 High St., Boston

CONVEYOR BELTS A SPECIALTY

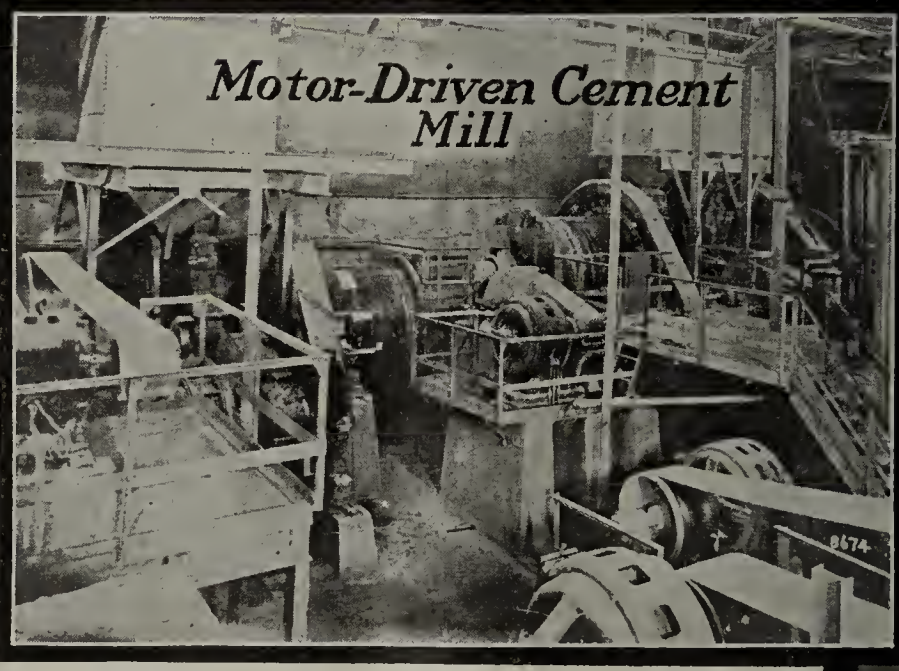
# Attaining The Maximum In Output and Economy

## Finally Narrows Down To The Adoption of-

W
WESTINGHOUSE ELECTRIC

*Westinghouse Motors and Control*

*Increase production, are economical in the use of power, and lower maintenance costs.*




The war is showing us the faults of the past, and is leading us to newer methods and higher efficiencies.

The Cement plant is no exception. Greater speed and efficiency is needed. Many have already taken the forward step and are reaping the benefits of Westinghouse Electric Drive.

You will not attain your maximum until you adopt Electric Drive.

**Westinghouse Electric & Mfg. Co.**

**East Pittsburgh, Pa.**

# Westinghouse—Electric Drive

# STEEL BARS FOR Reinforcing Concrete

OUR SERVICE
ESTIMATING
SETTING AND BENDING DETAILS
BENDING

PLAIN AND DEFORMED ROUNDS AND SQUARES

Shipments from Stock and Mill Rolling

## CALUMET STEEL COMPANY

CONTINENTAL AND COMMERCIAL BANK BUILDING
CHICAGO

## THE FULLER ENGINEERING COMPANY

**Designing, Constructing and Operating Engineers**
**Cement and Hydrated Lime Plants a Specialty**

**Reports, Examinations and Analyses of Raw Materials for Cement Consultations Solicited**

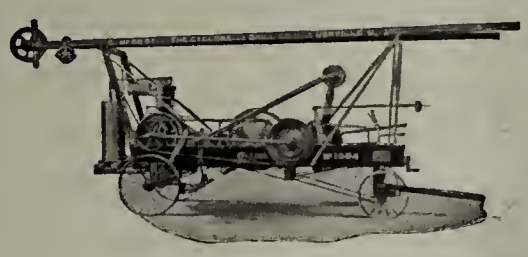
**Offices: Allentown National Bank Bldg.**
**ALLENTOWN, PA.**

# WATER

WE-FU-GO AND SCAIFE
PURIFICATION SYSTEMS
SOFTENING & FILTRATION
FOR BOILER FEED AND
ALL INDUSTRIAL USES

WM. B. SCAIFE & SONS CO. PITTSBURGH, PA.

## A Big Blast-Hole Drill That's Reliable



### The Cyclone No. 14

Heavy, solidly braced frame — Sill timbers 4" x 14". All machinery placed directly on the main sills protecting it against strains and preventing top heaviness. **Eighty per cent (80%) of the castings are cast steel**—not cast iron. The Cyclone No. 14 is the only Blast-Hole drill so built. Furnished in Steam, Gasoline, Compressed Air or Electric Power; traction or non-traction.

**The Sanderson Cyclone Drill Co., Orrville, Ohio**
**Eastern and Export Office, 50 Church St., New York, N. Y.**

# PULVERIZED COAL EQUIPMENT

AERO PULVERIZER CO., 120 BROADWAY, N.Y.

## WOULD YOU USE AN INTERMEDIATE SYSTEM FOR CONVEYING YOUR FINISHED GRAVEL FROM PLANT TO CAR IF YOU COULD SPOT THE CAR UNDER THE SPOUTS OF THE BIN?

Not If You Could Help It Would You?

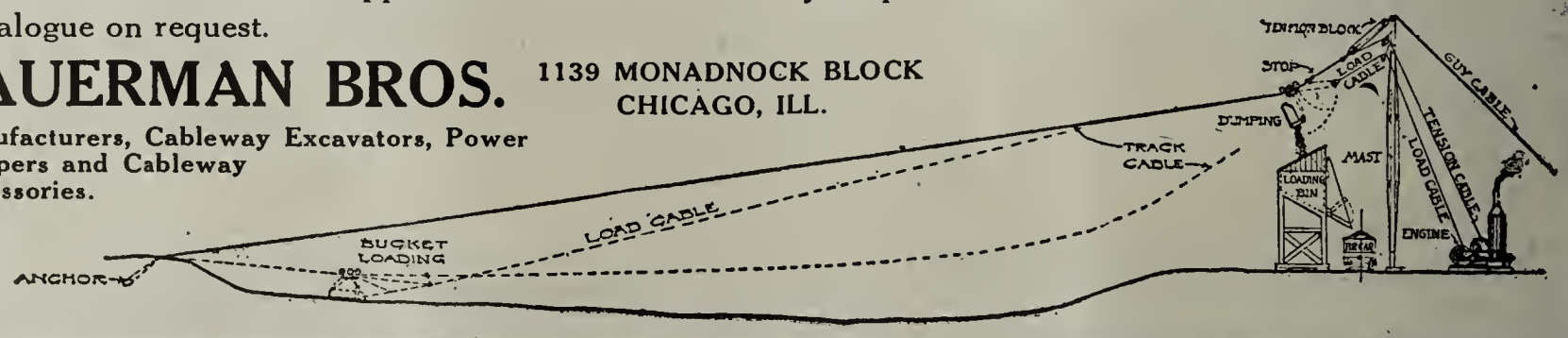
Then is it not just as logical to do away with an intermediate conveying system between **pit** and plant?

Are you using one machine for digging the material and another to convey it to the plant when you could just as well use one machine for the combined operation, saving the additional labor, machinery and upkeep cost?

The Sauerman Dragline Cableway Excavator is digger, conveyor and elevator combined in one.
It is the direct method from pit to plant.
It digs, conveys, elevates and dumps in one continuous forward operation.
Operated by a double drum friction hoist under one man control.
One Machine—One Operation—One Man Control
If you are interested in the application of this machine to your plant write us for further information.
Catalogue on request.

**SAUERMAN BROS.** 1139 MONADNOCK BLOCK CHICAGO, ILL.

**Manufacturers, Cableway Excavators, Power Scrapers and Cableway Accessories.**




# Flexo-Galvanized Steel Moulds

For Producing

# Poured Concrete Building Stone

Greatest Labor Saving Device of the Times.
A God send to the Building Block Industry.

"FLEXO-CRETE"

Eliminates Competition by producing BETTER BLOCKS with LESS LABOR than by any other method known to the industry. Write us for illustrated and descriptive matter. Full particulars given on request.

*We ship on thirty days trial to responsible parties.*

**Flexo-Concrete Mould Company.** **Cedar Rapids, Iowa**

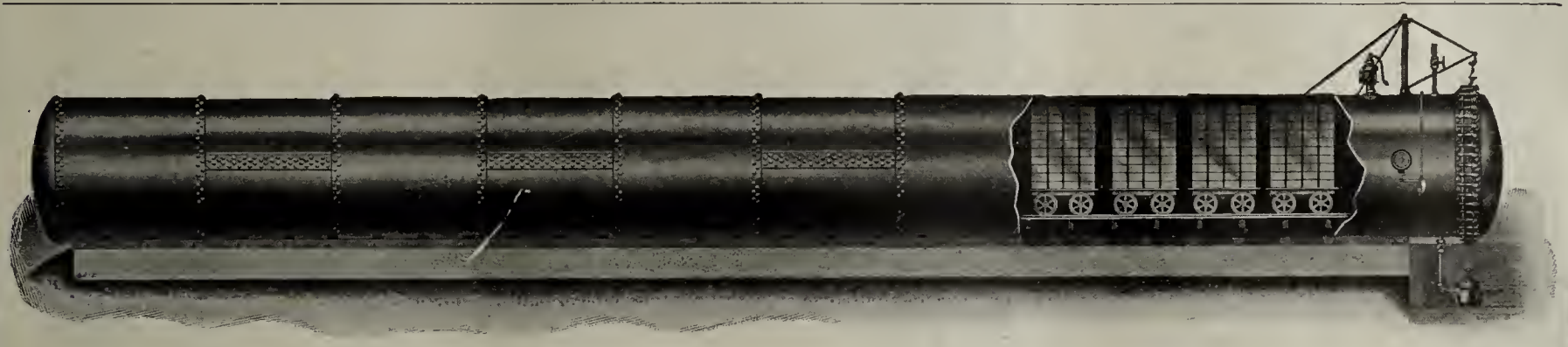
# Sand Lime Brick Machinery

Our complete line of Sand Lime Brick Machinery makes it possible to secure just that machinery which is required to make your plant a success. We favor no particular type of machinery but are guided by the needs of the customer. Our wet and dry grinding mills have transformed a number of unsuccessful plants into dividend producers, while our Presses, Mixers, Hardening Cylinders and other equipment are of equal quality. We can exactly meet the demands of any manufacturer with a quality of machinery which will operate at a profit with a minimum amount of attention and expense.

*Correspondence solicited*

## The American Clay Machinery Co.

WILLOUGHBY, OHIO



## EXCEPTIONAL OPPORTUNITY

# Complete Cement Plant

## Capacity 750,000 Bbls. Annually

### LOCATION, BEDFORD, IND.

We own and offer for sale the above plant and offer it either as a whole or in part. Quotations will be made on any parts desired. Buildings:

| | |
|---|---|
| Raw Material Building | 130x135 ft. |
| Raw Material Annex Building | 43x 90 ft. |
| Rotary Kiln Building | 95x180 ft. |
| Coal Drying and Grinding Bldg | 58x 80 ft. |
| Dry Grinding Building | 90x114 ft. 5 in. |
| Storage Warehouse | 80x250 ft. |
| Boiler and Power House | 91x100 ft. |
| Repair Shop | 30x119 ft. |
| Coal Storage Building | 25x100 ft. |

All buildings structural steel with brick walls.

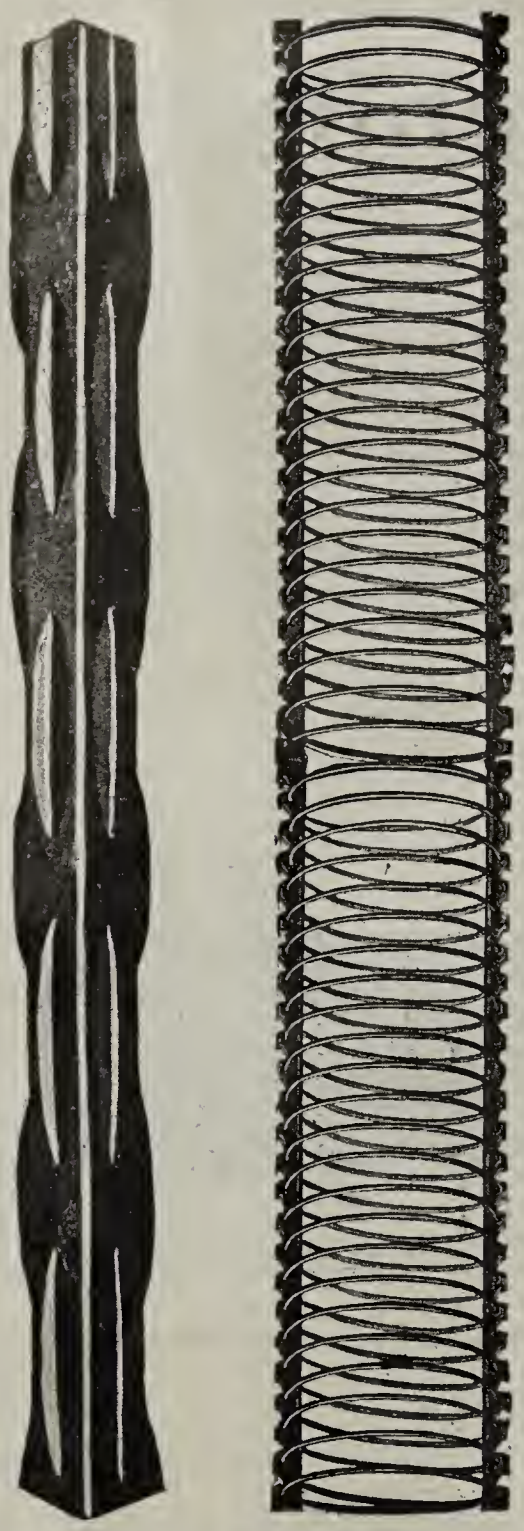
2—300 H.P. Cahall Vertical Water Tube Boilers.
4—250 H.P. Geary Water Tube Boilers.
1—375 H.P. Heine Boiler.
All 160-lb. pressure.
1—1000 K.W. Vertical General Electric-Curtis Turbo-Generating Set.
1—800 K.W. Vertical General Electric-Curtis Turbo-Generating Set.
Both sets 3 phase, 25 cycle, 480 volts; one complete switchboard panel for the above, also condenser for the turbines, circulating pumps—everything complete and now in position.
20—10-ton steel hopper dump cars.
2—Austin No. 6 Gyratory Late Type Crushers, with elevators, screen, etc.
1—60 in. x 50 ft. Moser Dryer.
2—60 in. x 40 ft. Sinker Davis Dryers.
1—Allis-Chalmers set of Anaconda Rolls, sizes 40x15 in.
3—5x22 ft. Gates Tube Mills.
32—30-in. Griffin Pulverizing Mills.
10—Allis-Chalmers Rotary Kilns, 7 ft. to 5 ft. 6 in. x 60 ft., complete with Automatic Kiln Feeder Boilers, coal pulverizing equipment, etc.

Besides the above, the plant is equipped with all the necessary conveyors for material, elevators, all copper wire for transmitting current, laboratory complete, office buildings, stone quarry, shale quarry, sidings, workmen buildings and approximately 325 acres of Real Estate.

*For Prices and Full Particulars Address*

## McCOY-BRANDT MACHINERY COMPANY

216-218 Penn Avenue, Pittsburgh, Pa.



STEEL BARS

AND

SPIRALS

FOR

REINFORCED CONCRETE CONSTRUCTION

# "Bars on the Job Ready for Your Men"

Delay, caused by the failure to have your reinforcing material on the job not only throws out your calculations but also the schedule of every other contractor on the job.

You can save the loss of much time and money by specifying Havemeyer Bars for your reinforced concrete work.

Their prompt service insures your having bars on the ground when the men go to work.

## HAVEMEYER BAR

Service insures direct shipments of reinforcing steel from our Chicago warehouse, which is located within easy teaming distance of the loop and makes delivery when material is needed.

Havemeyer Products, Bar-Tys, Bar-Spacers, Ty-Chairs, Beam-Saddles, Etc., keep the steel in its right place while the concrete is being poured.

*Try Our Service*

## CONCRETE STEEL CO.

MONADNOCK BLDG. CHICACO

# INVESTIGATION AND EXPERIENCE ARE PROVING THE RELIABILITY OF HYDRATED LIME

## FOR WATER PROOFING AND TO FACILITATE POURING CONCRETE

In these 51 concrete storage tanks, recently erected in Cedar Rapids, Iowa, by the Quaker Oats Co., there are approximately 12,500 cubic yards of concrete—1-2-4 mix. The walls are perfect cylinders, with no lips or bulged surfaces.

Hydrated lime was used for waterproofing and also to facilitate pouring the concrete and lifting the forms, owing to its lubricating properties. In mixing, 25 pounds of hydrated lime was put into each batch, which made the percentage of lime to cement a little over 8% by weight. The mixers used were of such size that three bags of cement could be used in each batch.

Considerable credit is given by the Leonard Construction Co. of Chicago to the lime. The statement is made that the lime gave the exterior surface a white and uniform appearance, and that the surface needed no subsequent coating. There were no joints where the concrete stuck to the forms and "lifted," as it does in many cases where the concrete is not of uniform mixture.

***Write any of the following competing manufacturers of Hydrated Lime for complete informatoin about Hydrated Lime in Concrete***

**Marblehead Lime Co.,** Chicago—Kansas City

**Glencoe Lime & Cement Co.,** St. Louis, Mo.

**The A. & C. Lime Co.,** Canton, Ohio

**John D. Owens & Son Co.,** Owens, Ohio.

**Port Byron Lime Assn.,** Port Byron, Ill.

**Ste Genevieve LimeCo.,** St. Louis, Mo.

**Kelley Island Lime & Transport Co.,** Cleveland, Ohio

**Woodville Lime Products Co.,** Toledo, Ohio

**TidewaterPortlandCementCo.,** Baltimore, Md.

**Palmer Lime & Cement Co.,** 103 Park Ave., New York, N. Y.

**National Lime & Stone Co.,** Carey, Ohio

**Merion Lime & Stone Co.,** Norristown, Pa.

**Lee Lime Co.,** Lee, Mass.

**Rockland & RockportLime Co.,** New York—Rockland, Maine—Boston

**Ohio Hydrate & Supply Co.,** Woodville, Ohio

**Vermarco Lime Co.,** West Rutland, Vt.

**Riverton Lime Co.,** Riverton, Va.

**Union Lime Co.,** Milwaukee, Wis.

# For Sale

500 tons new O. H. 105 lb. NYC standard rails with splices.

1000 tons new O. H. 90 lb. ASCE rails with splices. Will quote on entire quantity or on such lots as required for prompt shipment.

**M. MITSHKUN CO.,**
**BOOK BUILDING**
**DETROIT, MICHIGAN**

**LOCOMOTIVE CRANES**
**STEAM SHOVELS**
**LOCOMOTIVES**
**CARS**
**RAILS**
**HOISTING ENGINES**
**GRAB BUCKETS**
**STONE CRUSHERS**
**COMPRESSORS**
**ETC.**

Try us for honest value in dependable "used" material of this character. We'll treat you right.

**Wm. B. Grimshaw Co.**
1052 Drexel Bldg., Phila., Pa.
Dealers in "Used" but "Not Abused" Machinery

**FOR SALE**

# Rebuilt Machinery

**For Immediate Delivery**

1—16x32x42 Cross-Compound Murray Rolling Mill Corliss Engine, belt drive.
1—400′ Worthington Surface Condenser.
2—66″x16′ Tubular Boilers.
1—16x36 Double Eccentric Heavy-Duty Fulton Corliss Engine, belt drive.
1—14x20 Atlas Automatic Engine, belt drive.
1—40x60 No. 10 gauge Steel Stack.
1—36x70 No. 10 gauge Steel Stack.
1—5x7½ Vertical Throttling Engine.
1—Induced draft Fan, 60″ diameter, 30″ outlet—steam driven.
1—20x34x28 Tandem Compound Fitchburg Engine, direct connected to 300 KW. direct-current G. E. generator.
1—450 KW. G. E. Alternator, 2300 volts, 3 phase, 60 cycle, direct connected to E. P. Allis Cross Compound Engine; steam driven surface condenser with switchboard panel and instruments.
1—800 KW. G. E. Alternator, 2300 volts, 3 phase, 60 cycle, direct connected to McIntosh & Seymour horizontal heavy-duty engine, 100 RPM.
1—New 350 HP. IXL Open Feed Water Heater, purifier and receiver, with cut-out valve and oil separator.

**H. J. GEBHARDT**
**1421 FISHER BUILDING** **CHICAGO**

*New and Second Hand Bargains*

# CARLIN'S

**SHEARS DERRICKS**
**GRINDING PANS**
**ELECTRIC HOISTS**
**BUCKETS**

*Same location for 69 years*

**JOHN H. CARLIN MACHINE CO.**
140 Lacock St., N. S., Pittsburgh, Pa.

# For Sale by Owner

1—American Hoist Engine, 5½″x8″, D. C. D. D., with Sleuthing Attachment & Boiler.
1—No. 5 AUSTIN Gyratory Crusher.
600′ 1¼″ Plow Steel Cable.
1—INGERSOLL-RAND Air Compressor, Imperial type 10, Double Stage, 12x12 & 7½x12, capacity 327 Cubic Feet, direct connected to General Elec. 50 H. P. Motor with Auto Starter and including Receiver Tank and Automatic Unloader.
1—All Steel Derrick with Bull Wheel, and Interchangeable Boom for lengths 30′, 60′, 90′ and 110′.
1—General Elec. 50 H. P. Motor, A. C., 2 phase, 860 R. P. M.

**BETTENDORF STONE COMPANY**
**820 Kirkwood Blvd.** **Davenport, Iowa**

# Scrap Cement Bags

We are in the market for an unlimited quantity of scrap cement bags. Write or wire prices, stating quantity and whether dusted or not.

**Clayton Shoddy & Cotton Mills**
**CLAYTON, N. J.**

FOR SALE

## SMALL RODS

18 tons ¼-in. plain squares, 8—21 lengths.
20 tons ¼-in. plain rounds, 8—21 lengths.
20 tons ¼-in. deformed squares, 8—30 lengths.
30 tons ¼-in. deformed square, 8—30 lengths.

Immediate stock shipment, cut to lengths if desired. Will sell any part or all, also a miscellaneous quantity of larger rods.

**MODERN ENGINEERING CO.**
19 So. La Salle St., Chicago, Ill.

17—12-yd. Western

## DUMP CARS

excellent condition, $1050 each.

3—Stg. gg.

## LOCOMOTIVES

1—50-ton, 6-wheel switcher, $6500.
1—30-ton 4-wheel switcher, $5500.
1—50-ton 6-wheel switcher, $10,000

*All excellent condition, ready for immediate service.*

**THE FRED R. JONES CO.**
**City Hall Square Bldg., Chicago.**

# WANTED RAILS

80 lbs. 85 lbs. 90 lbs.
100 lbs. with angles

***Wire us what you have to offer***

**The Fishel & Marks Co.** **Cleveland, O.**
**Pittsburg** **Chicago** **Detroit**

# Relaying Rails

We have for immediate shipment:
250 tons of 30-lb. Relaying Rails.
150 tons of 35-lb. Relaying Rails.
Complete, with splice bars.
Atlanta (Ga.) delivery.

***Write or Wire for Price***

**The Isaac Joseph Iron Co.**
**525 Reading Rd.** **Cincinnati, O.**

# FOR SALE—The following plant and equipment used on our completed contract for the construction of the Fourth Lock at Sault Ste. Marie, Michigan, for the United States Government.

### STEAM SHOVEL

1—70C Bucyrus steam shovel, 2½-yd. dipper; shop No. 1536. August delivery.

### LOCOMOTIVES

6—Porter locomotives, 11x16 cylinders, four-wheel, connected, saddle tank, 36-in. gauge, 20-ton each, 31-in. diameter driving wheels, 165-lb. boiler pressure, 8760 lb. tractive force. August delivery.

### CARS

34—Western 5-yd. heavy duty two-way dump cars, 36-in. gauge. New in December, 1917. August delivery.

6—Koppel cradle two-way steel dump cars, 36 cu. ft. capacity, 24-in. gauge. Immediate delivery.

12—Koppel steel flat cars, size 19 ft. by 4 ft. 8 in., 36-in. gauge, 30,000 lb. capacity. July delivery.

### BUCKETS

26—Lakewood, 65 cu. ft. capacity, two-line bottom dump concrete buckets. July delivery.

2—Owen type "H" clamshell buckets, 2 cu. yd. capacity. July delivery.

### AIR COMPRESSORS

1—Chicago Pneumatic Tool Co. compressor, size 12x12 GSB, motor drive, shop No. 4760. July delivery.

1—Chicago Pneumatic Tool Co. compressor, size 10x12 GCSC, steam drive, shop No. 5535. Immediate delivery.

1—Chicago Pneumatic Tool Co. gasoline truck mounted compressor, bought new in 1916, excellent condition.

### DERRICKS

1—Steel stiff-leg derrick, 25-ton capacity, 80-ft. boom, with bull wheel. Immediate delivery.

### DERRICKS—Continued

4—Steel guy derricks, 10-ton capacity, 80-ft. mast, 70-ft. boom. Immediate delivery.

1—Traveling derrick, 25-ton capacity, 80-ft. steel boom, with bull wheel. Immediate delivery.

### HOISTS

1—Thomas double-drum electric hoist with 100-hp. D.C. motor. Immediate delivery.

1—Thomas double-drum electric hoist with 50-hp. D.C. motor. Immediate delivery.

### ENGINES

1—Erie stationary horizontal steam engine, size 16x18. Immediate delivery.

1—Leonard-Ball stationary horizontal engine, size 7x10. Immediate delivery.

1—Dean steam condenser, 8x14x12. Immediate delivery.

### ELEVATORS

1—Patnoe steel chain elevator, complete on wood frame, with geared head and driving pulley, 35-ft. centers, 53 elevator buckets 42x19 in. Immediate delivery.

1—No. 8 geared head elevator, complete on wood frame, with 32-in., 8-ply belt, 69-ft. centers, 105 elevator buckets 30x17 in. Immediate delivery.

1—Elevator for handling crushed stone, 32-in., 8-ply MC rubber belt 151 ft. long, 87 malleable iron buckets. July delivery.

### CONVEYORS

1—Belt conveyor for handling crushed stone, belt traveling on troughing idlers, rubber belt 714 ft. long, 6-ply. July delivery.

1—Conveyor with two lengths 370 ft. each of 18-in., 4-ply Sawler belting, including pulleys, etc. (Used for conveying cement bags.) Immediate delivery.

### MIXERS

2—Ransome 2-cu. yd. capacity concrete mixers, type No. 64, with 50-hp. A.C. motor. July delivery.

### DRILLS

4—Leyner-Ingersoll piston type steam drills. Immediate delivery.

2—Ingersoll-Rand "Bull Moose" BCR type drill. Immediate delivery.

1—Ingersoll-Rand "Jap" BCR type drill. Immediate delivery.

4—Ingersoll-Rand rock drills, complete with weights and tripods. Immediate delivery.

### MOTORS

1—General Electric 35-hp. A.C. induction motor, with automatic starter, 220 volts. July delivery.

1—Western Electric 35-hp. A.C. motor, 220 volts, with self-starting automatic compensator. July delivery.

1—General Electric 50-hp. A.C. induction motor, 220 volts, with starting compensator. August delivery.

### PUMPS

2—Yeoman's 1½-in. horizontal, single suction, enclosed impeller centrifugal pump, capacity 100 GPM., 70-ft. head, with 5-hp., 3-phase, 220 volts motors. August delivery.

1—Yeoman's 4-in. Class "M" double suction horizontal centrifugal pump, capacity 500 G.P.M., 100-ft. head, with 25-hp., 3-phase G. E. motor. August delivery.

### MISCELLANEOUS

1—35-hp. General Electric D.C. motor, shop No. 152368 C.L. 35 form B., 135 amps., 220 volts, speed 610, with starting rheostat 35 hp., 220 volts, 250 normal, 125 amps., Cutler Hammer Mfg. Co. Excellent condition.

All of the above plant and equipment is in excellent operating condition and available for inspection. For further particulars and complete list address *Oscar Daniels Company, First National Bank Bldg., Chicago, Ill.*

# Sound Plant in Good Operating Condition For Sale

### AIR COMPRESSORS

1—2-cylinder 6x6 belt driven Gardner-Rix, capacity, 80 ft. per minute.
2—Ingersoll-Sergeant Class A, 18 x 8¼ x 24 Straight Line, steam-driven, 650 ft. per minute at 100 lb.
1—Rand Duplex, steam-driven, 600 ft. capacity with receiver.

### BOILERS

4—50-hp. locomotive type.
4—Vertical tubular. 1—12-hp. 1—15-hp. 1—20-hp.

### CABLEWAY

1—Lambert, 6-ton, 900-ft. span.

### CENTRIFUGAL PUMPS

1—18-in. Morris direct connected to double vertical steam engine.
1—10-in. Buffalo, double suction, belt driven.
1—15-in. Buffalo, belt driven.
1—20-in., belt-driven Worthington Turbine.

### DUMP CARS

20—3-yd. Peteler, 36-in. gage.
20 pairs of wheels and axles, for 4-yd. Western, extra heavy, brand new.

### ROCK DRILLS

100—McKiernan-Terry "Wizard" Rock Drills, 2¼ to 3-in., with tripods for air or steam, all brand new.

### FIRE PUMP

1—Worthington Duplex Fire Pump, 18½x9¼ x10, capacity 610 gallons per minute.

### CONCRETE MIXERS

2—Ransome, 1-yd. on skids, with steam engine, but no boiler.

### HOISTING ENGINES

1—10x12 Lidgerwood compound geared to drum 41x52-in. Has 25-ton pull. Suitable for mine work.
2—American, 7x10, double cyl., 2 drum, with boom swinger, but without boiler.
2—7x10 American D. C. D. D., with swingers and boilers.

**Locomotives, Drills, Pumps, Steam Shovels, Etc.**

***All thoroughly overhauled and ready for immediate and constant service.***

**UNITED STATES EQUIPMENT CO.,** 208 South LaSalle Street, Chicago.

PRACTICALLY NEW

## Used Crushing Equipment FOR SALE

1—Set 42x16" "Superior" Crushing Rolls.
1—Set 36x16" "Superior" Crushing Rolls.
1—Set 36x16" "Chalmers & Wlliams" Crushing Rolls.
1—Set 24x14" "Chalmers & Williams" Crushing Rolls.
2—No. 5 "Chalmers & Williams" Gyratory Crushers.

Good price, good condition, subject to inspection and immediate shipment.

**Galena Iron Works Corporation**
GALENA, ILLINOIS

## STEAM SHOVEL

Marion Model No. 20 with 1 1-4 yard dipper as good as new. Can make immediate shipment.

**CALUMET IRON & METAL CO.**
4022 S. Wells St., Chicago, Ill.

## BARGAINS Immediate Delivery

### HOISTS

8¼x10 in. Morrison, D.C., D.D.
7 x10 in. Stroudsburg, D.C., S.D.
9½x12 in. Lambert Cableway Engine

### ELECTRIC HOISTS

75 H.P. Flory, 3 drums and swinger, 440 volt, 60 cycle.
40 H.P. Lambert, D.D., 220 volt, D.C.
21 H.P. Lidgerwood, D.D., 550 volt, D.C.

### CRUSHERS

9x16 in. Climax.
10x22 in. Climax.
9x15 in. Champion
No. 5 Austin
Also several rotary screens

### BUCKETS

6—2½-yd. Lockwood bottom dump.

### COMPRESSORS

16x16x24x18 in. Ingersoll, 2 stage
10x 8x10x16x10 in. McKiernan, 2 stage
12x12x18 in. Laidlaw, straight line
12x12x12 in. Ingersoll, straight line
10x12x10 in. Ingersoll, straight line
16x10x10 in. Ingersoll, 2-stage, belt driven

**Also Pipe, Suction Hose, Etc.**

**WICKES MACHINERY CO.**
Claremont and West Side Aves.
Jersey City, N. J.

## FOR SALE—Prompt Delivery

8½ Miles 24-in. gauge Koppel Track.
1 Climax Geared Locomotive, 24-in. gauge.
1 6-in. Morris Centrifugal Direct Connected Pump.

**Western Contractors Supply Company**
41 South Canal Street Chicago, Ill.

One No. 4 March-Capron Concrete Mixer, without power, weight 7,000 lbs. Price 4c lb.

One Steel Cage, Hoppers, Wire Rope, etc., 5c lb.

One 5,000-lb. capacity two-drum Thomas Electric Hoist with 50 H.P. Motor; needs repair; $750.00.

One 28 H.P. Charter Gasoline Engine, $350.00.

**TEUSCHER & SON MCHY. SUP. CO.,**
St. Louis, Mo.

# For Sale—Immediate Delivery

***Owned By Us and Sold Under Absolute Guarantee***

### STEAM SHOVELS

1—95-C Bucyrus, shop number 1302.
5—70-C Bucyrus, shop numbers 1474, 1351, 1126, 1287, 1245, 2½-yd. dippers.
2—Standard 70-ton Bucyrus, shop numbers 733 and 572, 2½-yd. dipper.
2—45-C Bucyrus, shop numbers 1297, 1202; 1½-yd. dippers.
1—Model 60 Marion, shop number 1685.
1—85-C Bucyrus, shop number 1647, 4-yd. dipper.

### DRAG LINES

1—No. 2 Monighan and one Lidgerwood, on skids and rollers. 60-ft. boom, 2-yd. buckets.
1—Class 24 Bucyrus dragline on skids and rollers, 100-ft. boom, 3½-yd. bucket, equipped with electric light plant, also two extra buckets and a large amount of extra parts.
1—No. 1 Monighan all steel gasoline machine, mounted on walking device, equipped with 40-ft. boom and 1-yd. Page bucket.

### DUMP CARS

20—16-yd. standard gage Western air dump cars, with steel lined floors.
50—12-yd. standard gage, Western air dump.
15—12-yd. standard gage Oliver air dump.
100—3-yd. and 4-yd., 36-in. gage Western cars.
30—1½-yd., 24-in. gage.
7—Heavy duty, 4-yd. Western, 36-in. gage dump cars.

### LOCOMOTIVES

1—17x24 10-wheel Baldwin; Driving wheel centers 50"; driving wheel base, 13' 10"; weight on drivers, 84,000 lbs.; total weight, 164,000 lbs.; steam pressure, 180 lbs. Overhauled October 1, 1917. First class condition.
1—6-wheel 17x24 Big Four Switcher, with 8-wheel tender; weight on drivers, 87,200 lbs.; steam pressure, 140 lbs.; wheel base, 13' 8"; tractive force, 16,200 lbs. Now being overhauled. Ready for delivery 10 days.
1—16x24 4-wheel Davenport Switcher, with 8-wheel tender. Weight on drivers, exclusive of tender, 37 tons—47½ tons including tender. New in 1914. Has seen very little service.
1—11x16 cylinder 21-ton standard gage Davenport saddle tank locomotive. New in 1912. Westinghouse air brakes, automatic couplers, steam pressure, 165 lbs.
2—11x16 cylinder, 36" gage, Davenport saddle tank dinkies, practically new.
1—10x16 cylinder 18-ton standard gage Davenport saddle tank locomotive; automatic couplers, steam brakes, steam pressure, 145 lbs.
1—16x22 4-wheel switcher, C. M. & St. P., J-2 class, weight, 32 tons.
1—18x26, 8-wheel passenger type locomotive, Schenectady build; total weight, 51 tons; weight on drivers, 33 tons.
5—36-in. gage, 10x16 and 9x14 Davenport saddle tank locomotives.
2—7x12 in., 24-in. gage Davenport, shop number in the twelve hundred.

### REVOLVING TRACTION SHOVELS

1—25B Bucyrus traction shovel, shop number 1850, 1¼-yd. dipper; also special long dipper arm and ⅞-yd. dipper in addition to the standard equipment.

### RAIL, SWITCHES, SPIKES, ETC.

30—Complete switches for 60-lb., 70-lb. and 75-lb. rail, complete with target switch-stands, frogs, points, etc.
1—Carload 4½", 5" and 5½" spikes.
10 tons angle bars for 70-lb. and 75-lb. rail.
100 tons 52-lb. rail.

### SPREADER CARS

1—Standard Western spreader, almost new.
1—Standard, all-steel Jordan air spreader.

### SHOP EQUIPMENT

3—Brownell, 72"x18', Horizontal Tubular Boilers, with 4" tubes.
2—20x22¼x14¼x21 AA2 Ingersoll-Rand Compressors, complete with fittings.
1—20x22¼x15¼x21 AA1 Ingersoll-Rand Compressor.
1—66x18 Vertical air receiver, complete.
1—30x6 Vertical air receiver, complete.
1—16x16x18-in. Laidlaw-Dunn-Gordon Air Compressor with reservoir, weight 15,000 lbs.
1—Tire Lathe, 52-in. Swing, complete with countershaft.
1—Stationary Engine; horizontal center crank type; 10x12-in. cylinder, slide valve type; 25 H. P.

## CLAPP, NORSTROM & RILEY EQUIPMENT CO.

**12 and 14 South Canal St., Chicago** **Northwestern Branch: 1308 Pioneer Bldg., St. Paul, Minn.**

### QUARRY FOREMAN WANTED

"First class quarry foreman wanted" for Cement plant quarry in west. Address A. B. C., c/o Cement and Engineering News, 672 Transportation Bldg., Chicago, Ill.

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Wanted, First-Class Rock Quarry Foreman, a real man who can take charge of a quarry and actually knows how to get the rock out and push the work. Address Canadian Cement Manufacturer, care of Cement & Engineering News, 672 Transportation Bldg., Chicago.

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Wanted for sand plant, a machinist or millwright who is familiar with a boiler, engines, etc., and competent to repair dryer, screen, shafting, elevators, etc. Good salary, an all-year job and suitable living conditions. Address L. & L., care of Cement & Engineering News, 672 Transportation Bldg., Chicago.

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Experienced Cement Chemist wanted. Must be capable of acting as assistant manager. Address R-C. C., care of Cement & Engineering News, 672 Transportation Bldg., Chicago.


## USED MOTORS

**For immediate Delivery—Overhauled and Guaranteed—Largest Stock in America to Choose From. For Sale: 3 Phase, 60 Cycle, 220 V.**

| H.P. | | Speed |
|---|---|---|
| 1— 3 | —General Electric | 1800 |
| 1— 3 | —Westinghouse | 1200 |
| 1— 5 | —Wagner | 1800 |
| 1— 5 | —Allis Chalmers | 1200 |
| 1— 7½ | —General Electric | 1800 |
| 1—10 | —Westinghouse | 900 |
| 2—15 | —Westinghouse, Type CCL | 1750 |
| 2—15 | —Watson, slip-ring, var. speed | 1720 |
| 1—15 | —Fairbanks-Morse | 1200 |
| 1—15 | —General Electric, Form L | 1200 |
| 1—15 | —General Electric | 1200 |
| 3—15 | —Fairbanks-Morse, slip-ring, constant speed | 1200 |
| 1—15 | —Westinghouse, vertical | 1135 |
| 2—15 | —Allis-Chalmers | 1130 |
| 2—15 | —Allis-Chalmers | 860 |
| 2—15 | —Westinghouse | 850 |
| 4—20 | —Westinghouse | 1750 |
| 1—20 | —General Electric | 1200 |

Send for MONTHLY BARGAIN SHEET Showing Complete Stock and Net Prices

GREGORY ELECTRIC CO.
16TH AND LINCOLN ST
CHICAGO, ILLINOIS

Capital and Surplus, $500,000.00


### WANTED

Quarry Foreman, Cement plant, Eastern Pennsylvania—Steam shovel operation. State fully experience, reference and salary. Answer to Box C. C. H., c/o Cement & Engineering News, 672 Transportation Bldg., Chicago, Ill.

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Wanted: Complete second-hand cement plant, machine shop and laboratory outfit; must be in first-class condition. Address R. C. C., care of Cement & Engineering News, 672 Transportation Bldg., Chicago.

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### NO. 8 GATES BALL MILL FOR SALE

This Ball Mill has never been used. Complete with feeder, charge of balls and driving pulley. Price $4,500.00 for immediate sale. Address Box 142, c/o Cement & Engineering News, 672 Transportation Bldg., Chicago, Ill.

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### WANTED

Wanted at Once—Operating superintendent for a large dry process Rock and Shale plant in the East. Must have mechanical and executive ability. State age, past experience, position in draft, references and salary expected in first letter. Box 69, c/o Cement & Engineering News, 672 Transportation Bldg., Chicago, Ill.


## COMPRESSORS

| | Price |
|---|---|
| 1—12x12 Laidlaw-Dunn Gordon, belt driven, capacity 300' | $ 750 |
| 1—12x12x16 Ingersoll, straight line, steam driven, capacity about 300' at 80 to 100 lb | 600 |
| 1—Sullivan, 2 stage air, simple steam, capacity 1800' at 80 to 100 lb | 2,500 |
| 2—14x12 Bury Duplex, belt driven, capacity about 550' at 60 to 80 lb., each | 1,000 |
| 1—14x16x10x16 Sullivan, 2 stage air, simple steam, capacity 600' at 80 to 100 lb | 1,500 |
| 1—14x9x10 Bury, 2 stage, belt driven, capacity 350' | 1,500 |
| 1—Ingersoll-Rand Imperial Type XB2, 500' | 2,000 |
| 1—Sullivan 2 stage, belt driven, 1400' good as new, f. o. b. St. Louis | 4,500 |

## CARS

| | |
|---|---|
| 20—4 yd. Western, 2 way, contractors, 36" gauge, wooden bodies, each | $ 125 |
| 70—2½ yd. steel bodied, end dump quarry cars, 36" gauge, each | 80 |
| 30—2½ yd. steel bodied, end dump quarry cars, 48" gauge, each | 75 |
| 20—12 yd. Western, standard gauge MCB, air dump cars, almost new, each | 1,050 |
| 20—12 yd. Western, standard gauge MCB, air dump cars, good condition, each | 900 |
| 50—1½ yd. Koppel "V"-shaped, 24" gauge, steel cars, new, each | 120 |

## CRUSHERS

| | |
|---|---|
| 1—No. 9 Style "K," almost new | $7,000 |
| 2—No. 5 Austins, one straight and one angle drive, both fine condition, each | 1,500 |
| 1—No. 6 Style "D" Gates, fine condition | 2,000 |
| 1—No. 7½ Austin, almost new | 2,500 |
| 1—10x20 Blake jaw crusher on skids | 800 |
| 1—9x16 Good Roads Machinery, jaw crusher on wheels, with 22' elevator. | 800 |
| 1—9x16 Universal on skids, almost new. | 500 |
| 1—No. 7½ McCully | 3,000 |
| 1—No. 5 McCully | 1,500 |

## ELEVATOR AND SCREENS

| | |
|---|---|
| 1—No. 5 Gates 70' centers, almost new. | $ 700 |
| 1—No. 7½ Austin 62' centers, fine condition | 900 |
| 1—No. 9 with 36" buckets, good condition, without belt | 900 |
| 1—Stephens & Adamson stone screen, 42"x16', with dust jacket, practically new | 700 |
| 1—48x18 Austin screen with dust jacket | 800 |
| 1—48x20 McCully screen with dust jacket | 900 |

## CLAM SHELL BUCKETS

| | |
|---|---|
| 1—¾ yd. Owen with teeth, almost new | $450 |
| 1—1½ yd. Hayward, first class | 650 |
| 1—1 yd. Browning | 500 |
| 1—1½ yd. Page Dragline | 500 |

## CRANES

| | |
|---|---|
| 1—7 ton, 4 wheel Vulcan Bucyrus single line crane | $ 6,000 |
| 1—10-ton Browning 4 wheeled, with bucket | 7,000 |
| 1—15 ton Brown hoist, with 50' boom, 8 wheeled MCB, with 2 yd. Brown hoist, clamshell | 17,500 |
| 1—20 ton Brown hoist, 8 wheel MCB, 50' boom, and bucket | 18,000 |
| 1—25 ton Browning hoist, 8 wheel MCB, 50' boom, and bucket | 21,000 |

## HOISTING ENGINE

| | |
|---|---|
| 1—6¼x10 American DCDD, with boiler. | $1,000 |
| 1—7x10 Lidgerwood DCDD, with boiler | 1,100 |
| 1—7x10 Lambert, 3 drum, with boiler | 1,600 |
| 1—8x12 Mundy DCDD, with boiler | 1,300 |
| 1—9x10 Lidgerwood, 3 drum, 32" drums, without boiler | 1,900 |
| With boiler | 2,300 |
| 1—Clyde 9x10, 3 drum with boiler, f. o. b. Mich. | 2,500 |
| 1—5x8 DCDD Reversible O&S, with vertical engine, without boiler | 350 |
| With boiler | 550 |
| 1—7x10 Lambert DCDD, with boiler | 1,100 |

## LOCOMOTIVES

| | |
|---|---|
| 1—9x14 Vulcan, 36" gauge, saddle tank. | $1,250 |
| 1—9x14 Vulcan 36" gauge, saddle tank. | 1,350 |
| 1—10x16 Vulcan 36" gauge, saddle tank. | 1,600 |
| 1—10x16 American 36" gauge, saddle tank, good as new | 1,850 |
| 1—19x24 Baldwin, 10 wheeler, 60 tons. | 8,000 |
| 1—18x24 American, 10 wheeler | 5,000 |
| 1—17x24 6 wheel switcher | 5,000 |
| 1—14x24 Pittsburgh, saddle tank standard gauge with separate tender | 4,000 |

## DRAGLINES

| | |
|---|---|
| 1—Monighan-Walker steam machine, with 50' boom, 1½ yd. bucket, almost new | $7,000 |
| 1—Flory outfit engine 10x12 heavy dragline type boiler, fire box 150 lb. pressure, boom 60', steel bucket, 2 yd. New 1917 | 9,000 |
| 1—24 Bucyrus, with 85' boom | |

## RAIL

| | |
|---|---|
| 400 tons—35 lb., with angle bars | $57 |
| 1500 tons—56 lb., with angle bars | 58 |
| 100 tons—75 lb., with angle bars | 55 |

## PUMPS

| | |
|---|---|
| 1—10" Morris, sand, belt drive | $ 500 |
| 1—8" Morris, water, belt drive | 300 |
| 1—20x10x14 Worthington duplex | 600 |
| 1—Wilson-Snyder water works pump, complete with condenser | 2,000 |

## STEAM SHOVELS

| | |
|---|---|
| 1—No. 0 Thew on standard gauge railroad truck, ⅝ yd. dipper | $2,500 |
| 1—No. 0 Thew traction with ⅝ yd. dipper, fine condition | 4,000 |
| 1—14B Bucyrus traction with ⅝ yd. dipper, almost new | 4,000 |
| 1—18B Osgood traction with ¾ yd. dipper, high boom, one year old | 5,000 |
| 1—No. 1 Vulcan revolving shovel, standard gauge with ¾ yd. dipper, good as new | 4,500 |
| Same as above, with 35' crane boom | 5,500 |
| 1—45 ton Bucyrus, standard gauge, 1¾ yd. dipper | 6,500 |
| 1—Model 60 Marion with 2½ yd. dipper | 7,000 |
| 1—65 ton Bucyrus with 2½-yd. dipper | 5,000 |

## CABLEWAYS

| | |
|---|---|
| 1—9x10 Lidgerwood, 3 drum engine and boiler and carriage and part of other fittings, no rope | $3,000 |
| 1—50 hp. Flory DD electric with carriage and fittings, but no rope | 3,000 |
| 1—7x10 Flory steam DCDD with boiler, carriage and all fittings, but no rope | 1,950 |

## BOILERS

| | |
|---|---|
| 1—25 hp. vertical American hoist and derrick | $250 |
| 1—40 hp. firebox on steel truck | 550 |
| 1—50 hp. vertical butt strap | 750 |
| 1—60 hp. vertical Lidgerwood | 800 |

## MOTORS

| | |
|---|---|
| 1—20 hp. Westinghouse, 60 cycle, 3 phase, 220 volt | $400 |
| 1—30 hp. Westinghouse, 60 cycle 3 phase, 2200 volt | 450 |
| 1—35 hp. Westinghouse, 60 cycle 3 phase, 2200 volt | 500 |
| 1—50 hp. General Electric, 60 cycle 3 phase, 220 volt | 750 |

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*Successor to* GEO. C. MARSH & Co.

Tel. Harrison 5799

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# Complete Road Builders' Outfit For Sale

1—**20 hp. Reeves Engine.**
2—**Western Elevating Graders.**
25—**Western 1½ yd. Dump Wagons.**
2—**No. 16 Koehring Concrete Mixer,** steam driven, traction, paving type, with boom and bucket.
1—**½ yd. Austin Cube Concrete Mixers,** steam driven, traction, paving type, with boom, bucket.
1—**5 ft. Fairbanks,** gas driven, low charging, **Concrete Mixer.**
**7992 lin. ft. Heltzel Pat. Steel Forms,** 6 in. high.
**56 doz. Heltzel Pat. Hanging.**
2—**New Economy Sack Balers.**
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1—**Warehouse Truck, Fairbanks.**
2—**Concrete Paving Rollers,** 10 ft.
2—**Any weight Hand Rollers,** Max. wt. 300 lb.
2—**Gravity Brick Conveyors.**
2—**O. K. Harry Steel Water Tanks,** 6 ft. x 8 ft.
1—**O. K. Harry Steel Water Tank,** 4 ft. 6 in. x. 3 ft.
1—**O. K. Harry Water Wagon and Pump.**
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1—**No. 3 C. H. & E. Piston Force Pumps,** 2½ in. disch.
1—**Fairbanks 2 hp. Triplex,** 1 in. disch. **Pump.**
**Water Pipe with sleeves.**
1—**5-ton Kelly Springfield,** steam power **tandem roller.**
1—**No. 684 Western Graders,** 8 ft. blade.
1—**Little Western Grader,** 6 ft. blade.
8—**Western 2 wheeled Scrapers.**
4—**Maywood (Mormon) Scrapers.**
3—**No. 2 Drags, Westerns.**
6—**No. 3 Drags, Westerns.**
3—**No. 2 Michigan Scrapers.**
1—**4 Horse Western Plow.**
1—**2 Horse Western Plow.**
1—**24 in. Disc.**
1—**2 Horse Steel Jno. Deere Plow.**
2—**Western Rooters, No. 20.**
1—**Western Rooter, Giant.**
43—**Western Dump Cars,** steel frame, 24 ga., 1½ yd.
14—**Western Dump Cars,** wood frame, 24 ga., 1½ yd.
3—**Brick Wagons.**
3—**Sterling Trucks,** 2½ ton, Steel Dump Bodies, Wood Hoist, 2 months' use.
3—**Frogs, Switch Points and Throws,** 20-lb. rail.
1—**Track Tools.**
2—**Sheets Steel, 7 Steel Ties with Bolts, 4 Axles and Wheels,** for jumping crossing.
1—**Johnson Car Replacers.**
1—**Automatic Trip Jack.**
4—**Western Portable Telescoping Bins,** 20-yd. cap.
1—**Owen Clamshell Bucket,** ¾ yd.

The above equipment is located in Illinois, and at Granite City, Illinois, and St. Louis, Mo.
Prices Quoted are F. O. B. Cars at point of shipment.
Terms: Sight draft attached to bill of lading or terms on approved credit.
The equipment is in first-class working condition for used outfits, and is subject to inspection at point of shipment.
The equipment is offered subject to prior sale.

## Granite City Lime & Cement Company

**20th and A Streets, Granite City, Illinois**


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Sawyer Belting Co.
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Link-Belt Co.

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### Concrete Mixers
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W. E. Dunn Mfg. Co.
Jaeger Machine Co.
Kent Machine Co.
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Republic Iron Works.

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B. F. Gump Co.
Jeffrey Mfg. Co.
Link-Belt Co.

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Link-Belt Co.

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The Jeffrey Mfg. Co.
Daniel B. Luten.
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Jeffrey Mfg. Co.
Link-Belt Co.

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Austin Mfg. Co.
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Jeffrey Mfg. Co.
Sturtevant Mill Co.
Traylor Engr. & Mfg. Co.

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Co-operative Concrete Constr. Co.

### Speed Reducer Transmission
Foote Bros. Gear & Machine Co
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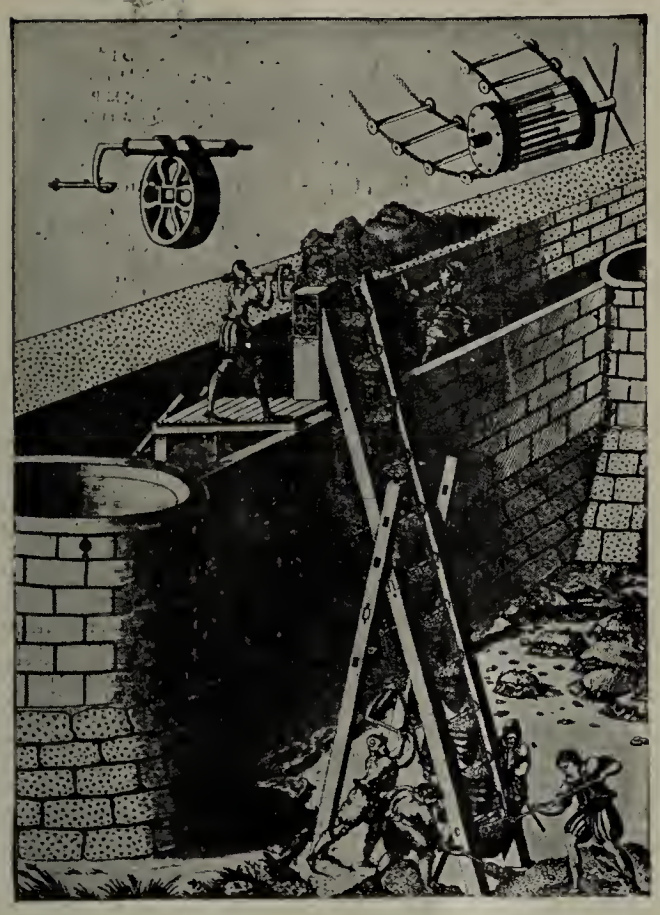
Sauerman Bros.



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**New York Boston Philadelphia Pittsburgh Dallas Birmingham Chicago St. Louis Milwaukee Seattle Denver Montreal Cleveland**

# CEMENT AND ENGINEERING NEWS

with which Gravel & Stone Magazine is incorporated

(PUBLISHED MONTHLY)

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Advertising copy or changes in ads. must be in this office by the 25th of each month, as hereafter our magazine will appear on the 5th of the following month

Advertising Rates Sent on Application

Vol. 30 CHICAGO, OCTOBER, 1918 No. 10



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*Mechanical Goods Division*
New York



Let Us Set You Up In Business

SELLING SILOS

"Caldwell" Silos

are ousting all others, because "Caldwell" Agents can give the Farmer *more for less money.*

No Territory to Buy
No Royalty To Pay

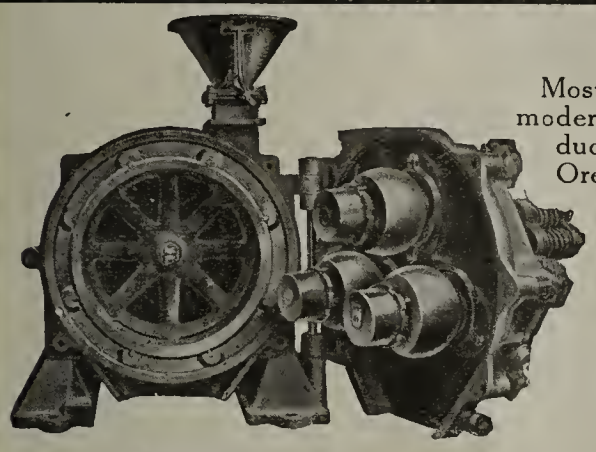
*Write Us.*

Co-operative Concrete Construction Company

Oskaloosa, Iowa

# STURTEVANT MILL CO.

**HARRISON SQUARE - - BOSTON, MASS.**



Ring-Roll Pulverizer

### RING-ROLL PULVERIZERS

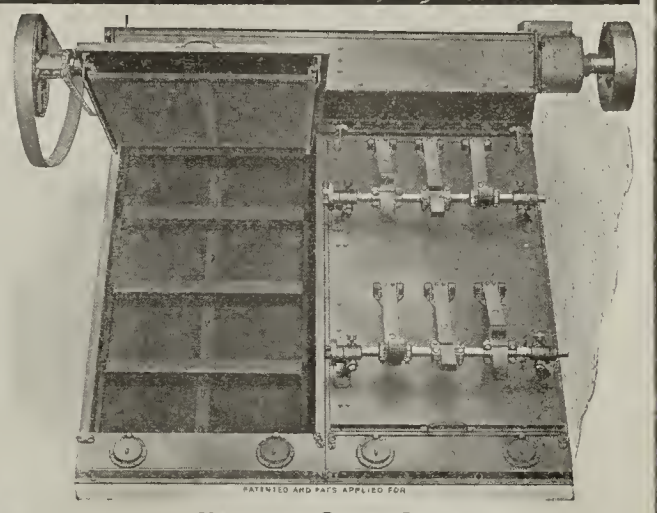
Most durable and efficient grinder for hard and moderately hard rock or ore. Used for the reduction of Cement- Clinker, Limestone, Quartz, Ores. Granite, Trap, Phosphate, Coal, etc., etc. Hundreds in use.

**Send for Circular 79**

### NEWAYGO SUPER-SCREENS

Inclined Vibrating Screen, Unit Construction. Screens everything screenable that is reasonably dry. Produces from ¼ mesh to 180 mesh.

**Send for Circular 77**

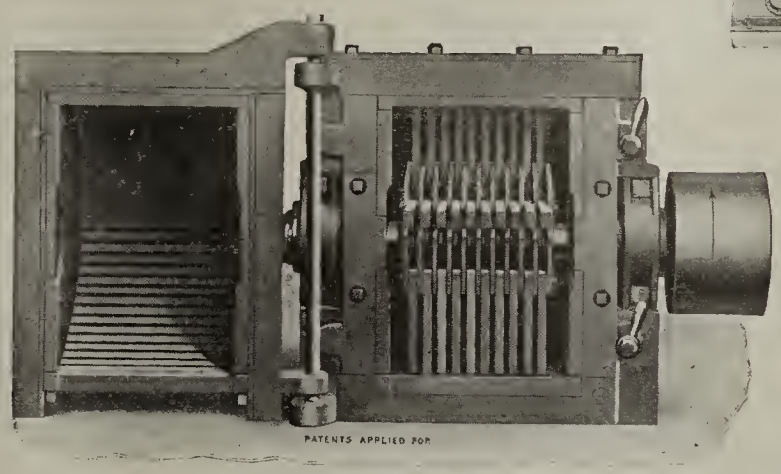


Newaygo Super-Screen

### SWING-SLEDGE MILLS

The greatest producers known on Limestone, Lime, Shells, Chemicals, Talc, Clay, Chalk, Bark, Rosin, Sulphur, Coal, Salt, and many other moderately hard and soft materials. High Speed Pulverizers, crushing by a series of blows delivered at high speed against the material fed into the machine.

**Send for Circular 84**



Swing-Sledge Mill

WE MAKE THE

**LARGEST COMPLETE**

LINE OF

**CRUSHING, GRINDING, SCREENING, WEIGHING, SACKING, ELEVATING AND MIXING MACHINERY**

**IN THE WORLD**

**Send for Condensed Circular No. 60**

## Henry Heil Chemical Company

**210 to 214 South Fourth Street, ST. LOUIS, MO.**

We make a specialty of supplying cement works with

**Chemical Apparatus, Chemicals and Reagents**

Gilmore's Needles, Cement Moulds, Vicat Apparatus, Schumann's, LeChatelier's and Jackson's Specific Gravity Apparatus, Etc.

**Pyrometers, Calorimeters**

**High Grade Goods Only**

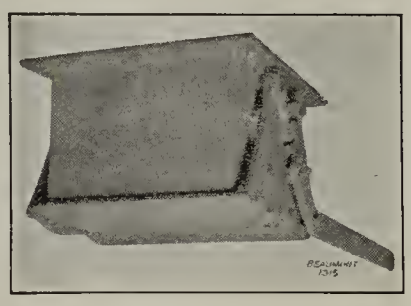
*Satisfaction Guaranteed*

## GET READY—

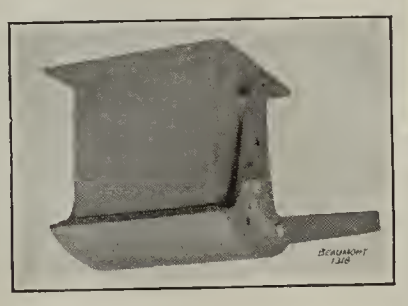
The concrete contractor who is equipping himself to build monolithic concrete grain storage, water towers, coal pockets and silos is laying the foundation for a big and prosperous business. A single POLK SYSTEM machine equips the contractor for all kinds of circular concrete work. Ask for our *latest* catalog.

**Polk Genung Polk Company**

706 Fisher Bldg. CHICAGO



DUPLEX GATE



SIMPLEX GATE

## Beaumont Bin Gates

**These Gates are made of best quality cast iron, of excellent workmanship. They are usually fitted with hand lever, but can be furnished with any type of control demanded by the conditions.**

*Write for Catalog No. 37 showing full line of Beaumont Gates.*

**BEAUMONT MFG. CO.**

460 Chestnut St., Philadelphia, Pa.

New York: 50 Church St. Boston: 141 Milk St.

# A Hettrick Conveyor Belt

**Making Wonderful Endurance Records at This Plant**

***"Has given us better satisfaction than any other belt we have ever used"***

writes J. L. Thomas, Superintendent, Tioga Gravel Co., Alexandria, La., whose plant is illustrated above.

The success of Hettrick Red Stitched Canvas Conveyor Belting is a plain case of "survival of the fittest." When mills similar to yours come back repeatedly with orders covering their conveyor belt requirements—what stronger evidence of merit can you ask?

The rains of spring, the heat of summer, the droughts of autumn the cold of winter, may do their utmost, but Hettrick continues on the even tenor of its way, doing its work faithfully and well, be it outdoors or indoors.

As a piece of workmanship it is the perfection of cotton weaving. As a transmitter of power it is unsurpassed. As a conveyor it is unequalled.

We would like to send cement and lime manufacturers and gravel, sand and crushed stone producers a sample and folder that tells the whole story of Hettrick Conveyor Belting.

## The Hettrick Mfg. Co.

TOLEDO, OHIO

# BLACK GIANT STITCHED DOUBLE BELTING

THIRTY thousand feet of BLACK GIANT DOUBLE STITCHED BELTING in sizes ten to twenty-four inch eight ply furnished within the last sixty days to two of the largest cement plants in the United States. Both of these plants have used BLACK GIANT DOUBLE STITCHED BELTING for the past five years. BLACK GIANT DOUBLE STITCHED BELTING is the most improved cotton belting manufactured today and is adapted for all kinds of work wherever machinery is run, either for transmission of power, elevators or conveyors.

*Manufactured exclusively by*

**McIlroy Belting and Hose Co.**

**Hammond, Indiana, U. S. A.**

**2-Yard Clam Shell Bucket**

**McMyler-Interstate Class "M" Two line; weighs about 4600 lbs.**
Condition Like New—Used But Thirty Days
**$775.00 f.o.b. Chester, Pa.**
Inquiries are solicited for Steam Shovels, Locomotives, Cars, Rails, Hoists, Derricks, Etc.

**Wm. B. Grimshaw Co.**
1052 Drexel Bldg., Philadelphia, Pa.
Dealers in
"Used" but not "Abused" Machinery

1⅛ IN. HY-RIB (SEVEN-RIB). Ribs 1⅛ in. high, 4 in. apart; sheets 24 in. wide.

# Insure Your Building Results

by using the complete line of material for use in all types of construction. Be sure of prompt delivery, as our complete stocks and large organization warrant immediate shipment.

## HY-RIB and RIB LATH

the acknowledged standard material, as used everywhere in all kinds of construction work.

The many depths, gauges and types of Hy-Rib adapt it to reinforcement of concrete floors and roofs. It is an ideal plastering surface for walls and ceilings and renders the building entirely fireproof. Easily put in place and on arched and curved work it is furnished bent to the exact curve.

Our complete line includes, in addition to the above, Diamond Lath in two types; Pressed Steel Channels and Studs of all varieties; four types of Corner Beads; three types of Base Screeds, etc. Send for free Hy-Rib Hand Book.

**TRUSCON STEEL COMPANY, Youngstown, Ohio**

*Representatives in Principal Cities*

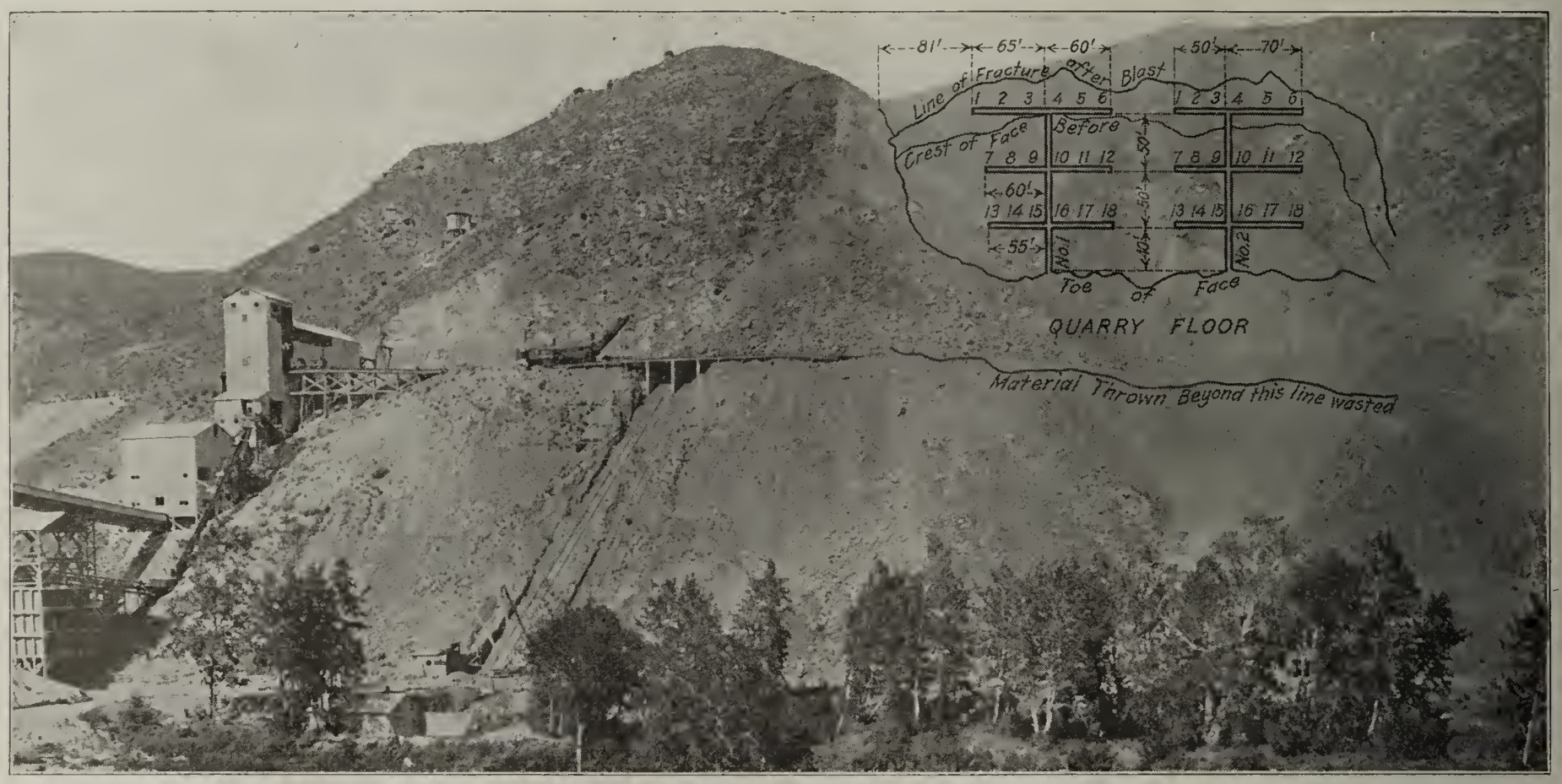
**For Concrete Roads**

Kahn Road Mesh
The most efficient reinforcement for concrete roads and pavements.

Kahn Curb Bars
Protect and reinforce concrete curbs.

Kahn Armor Plates
Perfectly protect expansion joints.

Write for Highway Pamphlet and estimates.




# LARGE BLAST ACCURATELY PLACES 897,000 TONS OF ROCK

This was accomplished by The Temescal Rock Co. of Corona, Calif., in a single blast by a system of tunnels so driven that charges of quick acting explosive would throw out the toe of the quarry face before the force of the remainder of the 48-ton charge was developed. Thus a barrier was formed which served to retain the major portion of the shattered material.

## FOR SAFETY AND EFFICIENCY

### THE EXPLOSIVE CHARGES WERE DETONATED WITH

## CORDEAU-BICKFORD DETONATING FUSE

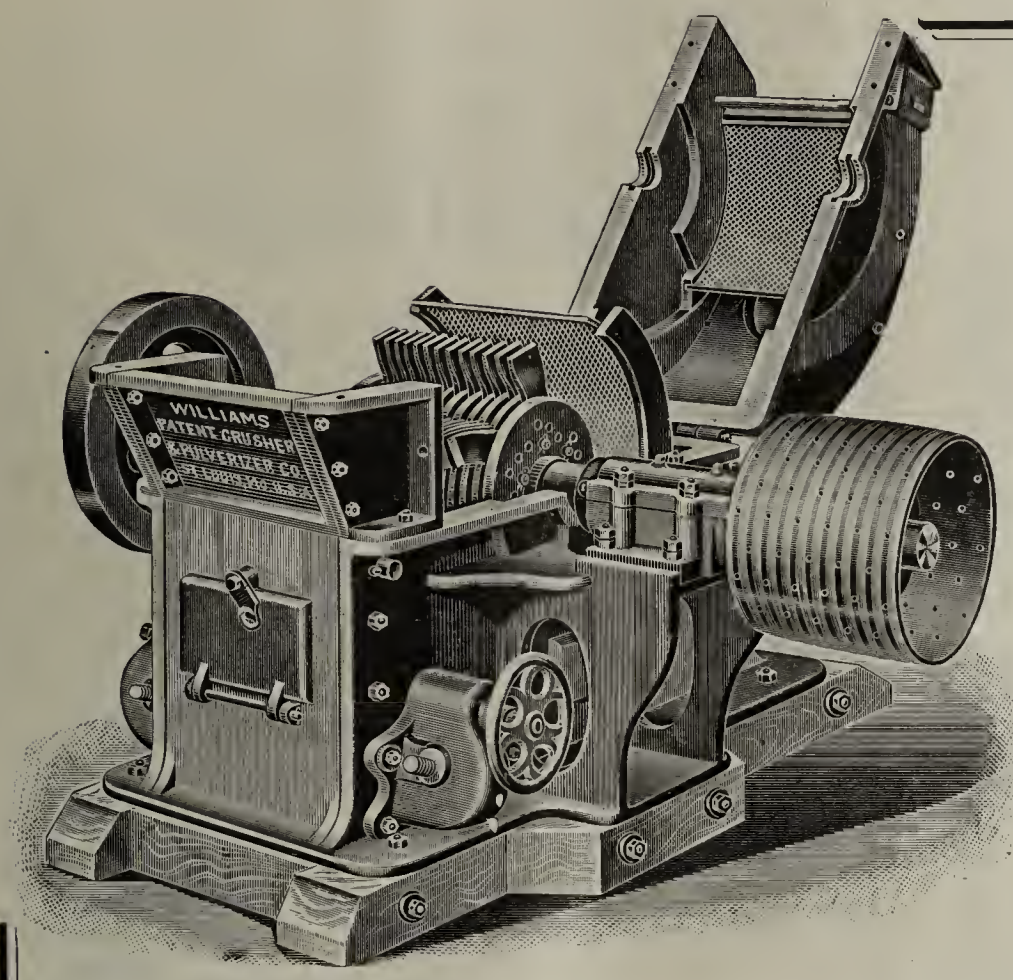
In a blast of this magnitude, consider the amount and value of the explosives used; add from 10% to 20% greater efficiency to your explosive by giving proper and complete detonation by means of Cordeau; add to this the safety features; and if you are not already using it, you will be interested in having a Cordeau booklet. Cordeau is a necessity to the far-sighted quarry owner.

WRITE FOR CORDEAU BOOKLET.

# THE ENSIGN BICKFORD CO.

**SIMSBURY, CONN.**

**ORIGINAL MANUFACTURERS OF SAFETY FUSE** **ESTABLISHED 1836**




# WILLIAMS
# LIMESTONE GRINDERS

**Take 2 in. to 3 in. dry stone and in one operation, without outside screens or separators will produce 95% through 20-mesh material.**

**CAPACITIES RANGE FROM ¼ TO 30 TONS PER HOUR**

**Over 5,000 Williams Mills in Daily Operation.**

BUY MORE
**LIBERTY BONDS**

There is undoubtedly room in your plant for one of these machines, which, in the last twenty-two years have proven that they are money savers, can be depended on, and really have merit. If further information is desired, Write for Bulletin No. 17, which is brim full.

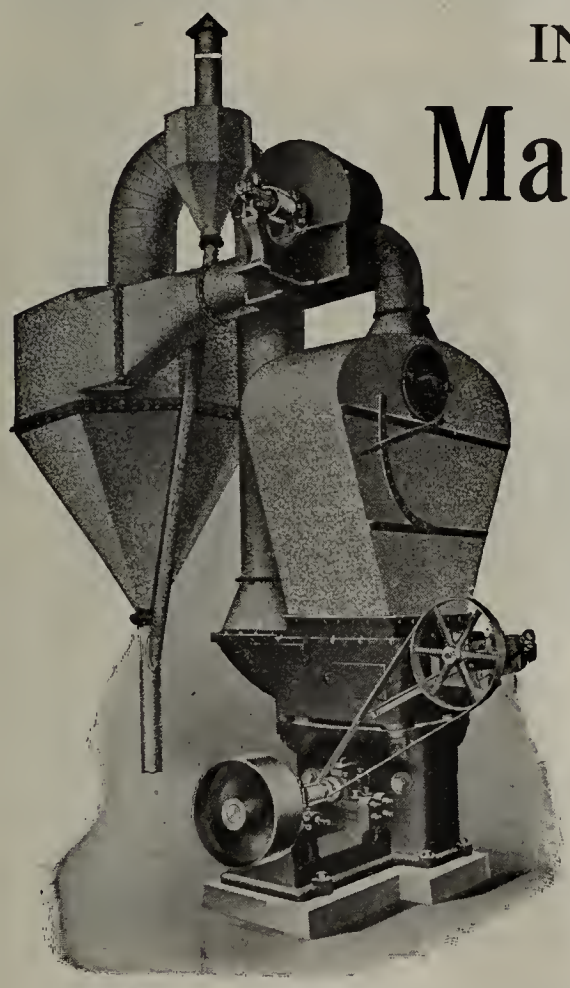
## THE WILLIAMS PATENT CRUSHER & PULVERIZER COMPANY

**General Sales Dept.—37 West Van Buren Street**
**CHICAGO**

**Plant**
**ST. LOUIS**

**67 Second St.**
**SAN FRANCISCO**

# Complete Grinding
IN ONE
# Machine



In successful use grinding Cement, Clinker, Limestone, Coal

INSTANT REGULATION OF FINENESS

NO DUST

*Send for Circular*

## THE BONNOT CO.
CANTON, OHIO

# GRANOLITHIC

**A superior, colorless, Liquid Cement Hardener**

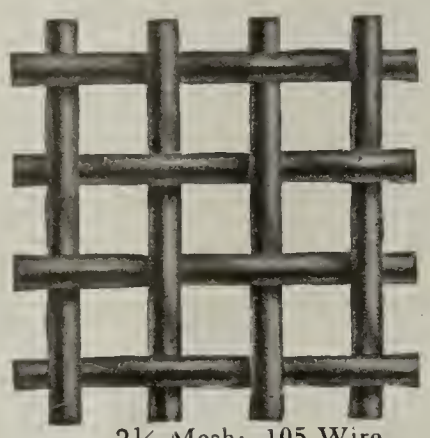
**GRANOLITHIC** makes cement floors Wear Proof—Dust Proof and Water Proof. The dust that is so injurious to merchandise, machine bearings and motors is eliminated. The cost of treating cement with **GRANOLITHIC** is trifling compared to the economies effected.

Unsolicited testimonials tell the story. Write for full particulars today.

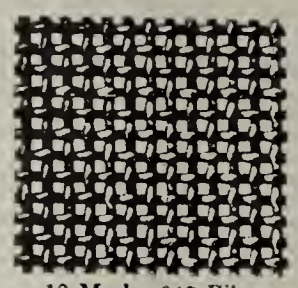
## GRANOLITHIC COMPANY, Inc.
**471 N. Snelling Ave., St. Paul, Minn.**
Midway

LIQUID CEMENT FLOOR HARDENER

## Cleveland Double-Crimped
# WIRE CLOTH



2½ Mesh; .105 Wire



1½ Mesh; .047 Wire

Renowned for its Uniformity, its Superior weave, its Durability. Especially adapted for SAND, GRAVEL and CEMENT Screens. A large stock of the various meshes always on hand.

***Price Right—Catalog on Request***

**THE CLEVELAND WIRE CLOTH & MFG. CO.**
**3575-83 E. 78th Street, CLEVELAND, OHIO**

# Speed Up Your Concrete Output

Maximum production and quality are assured wherever Vulcan Kilns are installed.

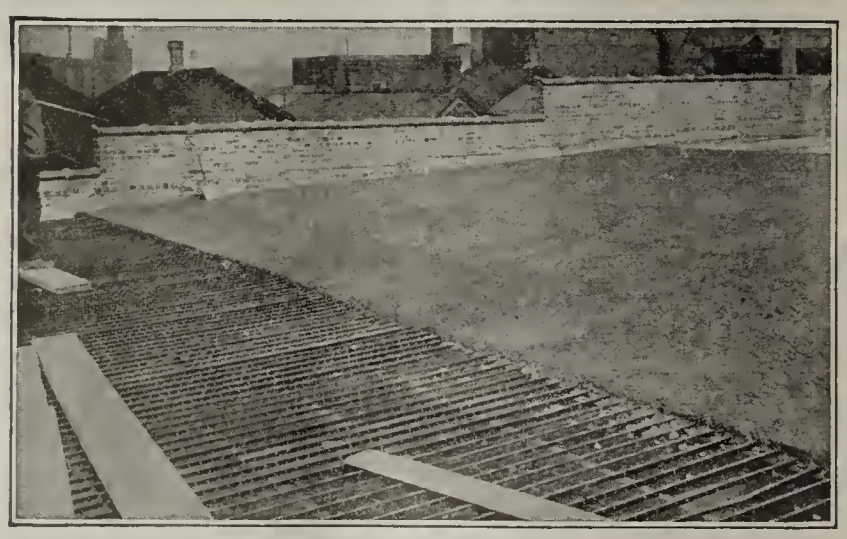
We are kiln **specialists.** We design and build special or standard types to meet specific requirements.

The results of forty years of study, labor and experimenting are at your command. Our engineers are ready and willing to assist and advise you.

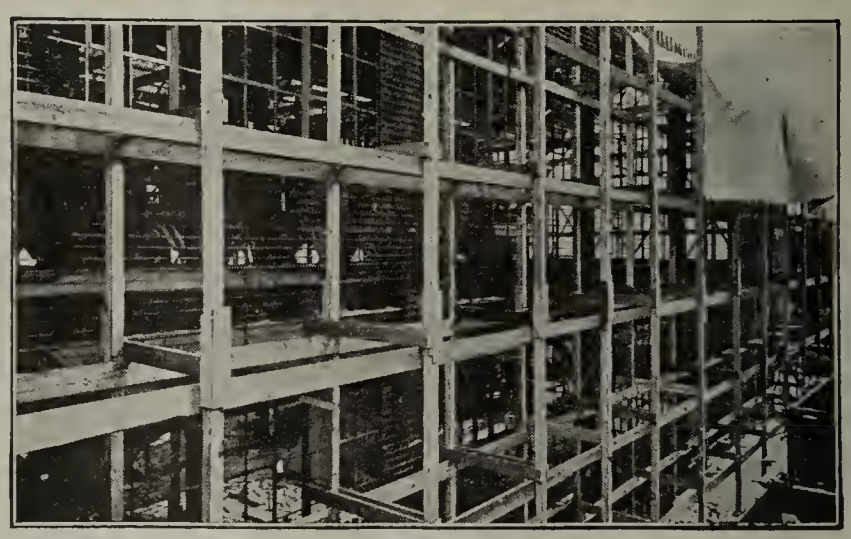
Write us now. Your request will bring a fund of valuable information.

**VULCAN IRON WORKS**
**1740 Main Street** **WILKES-BARRE, PA.**

# No Forms Required if T-Rib Chanelath Is Used



Concrete Floors Without Forms



Concrete Walls Without Forms

THE use of T-Rib Chanelath means conservation of lumber and economy in construction because the mesh of Chanelath acts as a form for concrete floors, roofs and walls. At the same time the rigid T-Rib provides all of the reinforcement necessary for the larger percentage of jobs. The efficiency of the T-Rib as a reinforcing member cannot be questioned. The concrete flows around the head of the T and forms a perfect mechanical bond.

*Our Chanelath Handbook describes the methods for using T-Rib Chanelath in the construction of walls for all types of structures. Let us send you a free copy.*

**North Western Expanded Metal Company**

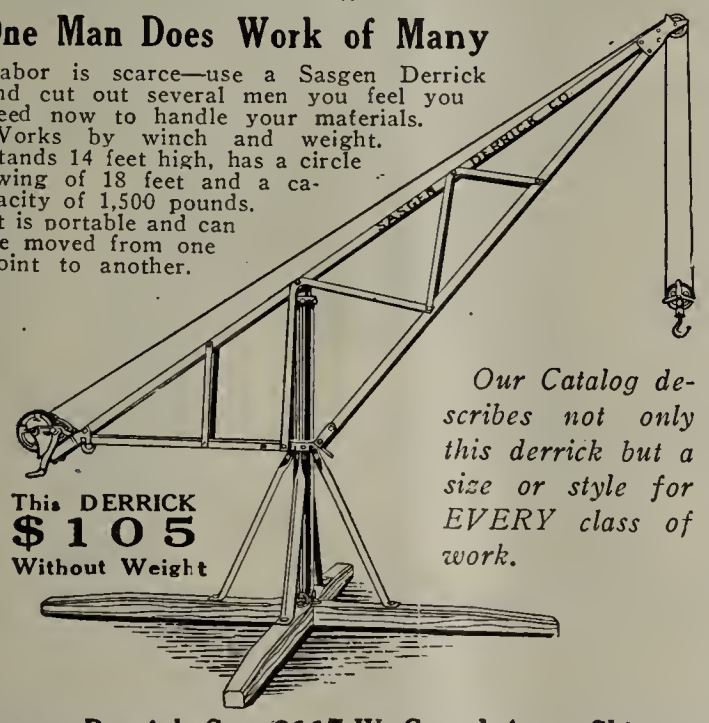
***Members of the Associated Metal Lath Manufacturers*** **Old Colony Building, CHICAGO, ILLNOIS**

# Load and Unload
## With a Sasgen Portable Derrick

The Sasgen Circle Swing Counterweight Derrick cuts costs, labor and time loading or unloading material from cars or wagons.

### One Man Does Work of Many

Labor is scarce—use a Sasgen Derrick and cut out several men you feel you need now to handle your materials. Works by winch and weight. Stands 14 feet high, has a circle swing of 18 feet and a capacity of 1,500 pounds. It is portable and can be moved from one point to another.




This DERRICK
**$105**
Without Weight

*Our Catalog describes not only this derrick but a size or style for EVERY class of work.*

**Sasgen Derrick Co., 3117 W. Grand Ave., Chicago**

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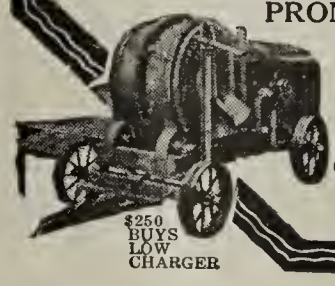
Pavers, Grouters, Hoists, Pumps,

**BOSS** HIGH SPEED

Building Mixers, Backfillers, Elevators

## Contractors' Equipment
BUILT OF STEEL WITH HYATT ROLLER BEARINGS

ASK ABOUT OUR HIGH DRUM TWO BAG PAVER



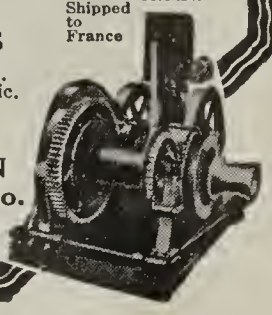
$250 BUYS LOW CHARGER

Astonishingly Low Prices
--Cash or Terms--
PROMPT DELIVERIES

All sizes from 5 ft. to 22 ft. cap., Gas, Steam or Electric. Complete stock carried in or near your city.

THE AMERICAN Cement Machine Co. Inc.
Keokuk, Iowa

OVER 100 SOLD IN ONE ORDER Shipped to France



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CALDWELL'S HELICOID

HELICOID Screw Conveyor is heavier, stronger and better made than any other. Requires fewer repairs—no lapped and riveted joints to come apart—flight all one piece. Special hangers, bearings and boxes for cement work. If you have anything to do with the manufacture of cement, you should write for our Catalogue.

Elevating, Conveying and Power Transmitting Machinery.

## H. W. CALDWELL & SON CO.
17th Street and Western Ave., CHICAGO

NEW YORK, Fulton Bldg., Hudson Terminal, 50 Church St.
DALLAS, TEXAS, 711 Main St.

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# *Have You Investigated?*

Half Bag Archer Mixer Delivering Direct Into Forms on Sewer Conduit Work

## Archer Mixers Are Proven Leaders

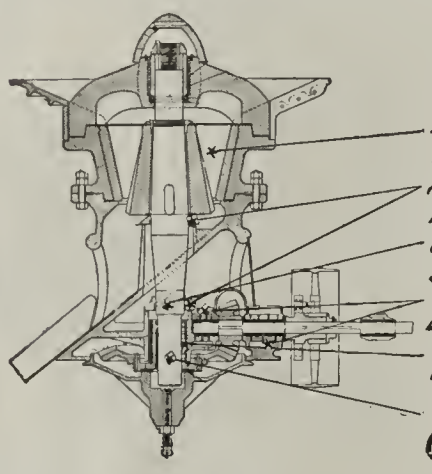
Do you want a mixer that will save you time on every job—a mixer that will enable you to get more work done with a smaller gang? Do you want a mixer that will save you so much that your extra profits will more than pay for the machine on your next job—or that will enable you to get more work by figuring lower? Then you must get the ARCHER—the original end discharge mixer.

Residences and farm buildings will constitute the majority of work next year. In this field the "half bag" ARCHER is, without question, unequalled.

**Let the ARCHER, Itself, Show You by Its Work How Much Better it is for You in Every Way. Write for "SHOW ME" Offer**

## Archer Iron Works, 2514 W. 34th Place, Chicago

# AUSTIN
## GYRATORY CRUSHERS



### *Six Special Advantages*

1. After adjusting for wear of head concaves will receive the same sized rock.
2. Upper and lower collars thoroughly protect working parts from dust and grit.
3. Automatic oil pump and oiling system, insuring thorough lubrication of all bearing surfaces.
4. Countershaft supported on both sides of driving pinion.
5. Rigid eccentric bearing.
6. Full eccentric bearing surface retained when head is raised.

*Made in Eight Sizes—50 to 5,000 Tons Per Day*

We sell Austin Gyratory Crushers on their mechanical superiority evidenced by the users. Amongst recent purchasers are the United States Government, Australian Government, etc. Austin Crushers have been identified with some of the most important engineering projects, such as the Mississippi Dam, etc.

Present your crushing problems to us for advice and estimate.

**Austin Manufacturing Company**
**CHICAGO**
New York Office: 50 Church Street



**CRUSH YOUR STONE and GRAVEL**

The Ideal Crusher for the Concrete Product Plants, Gravel and Crushed Stone Producer

The World's Famous Universal Crusher

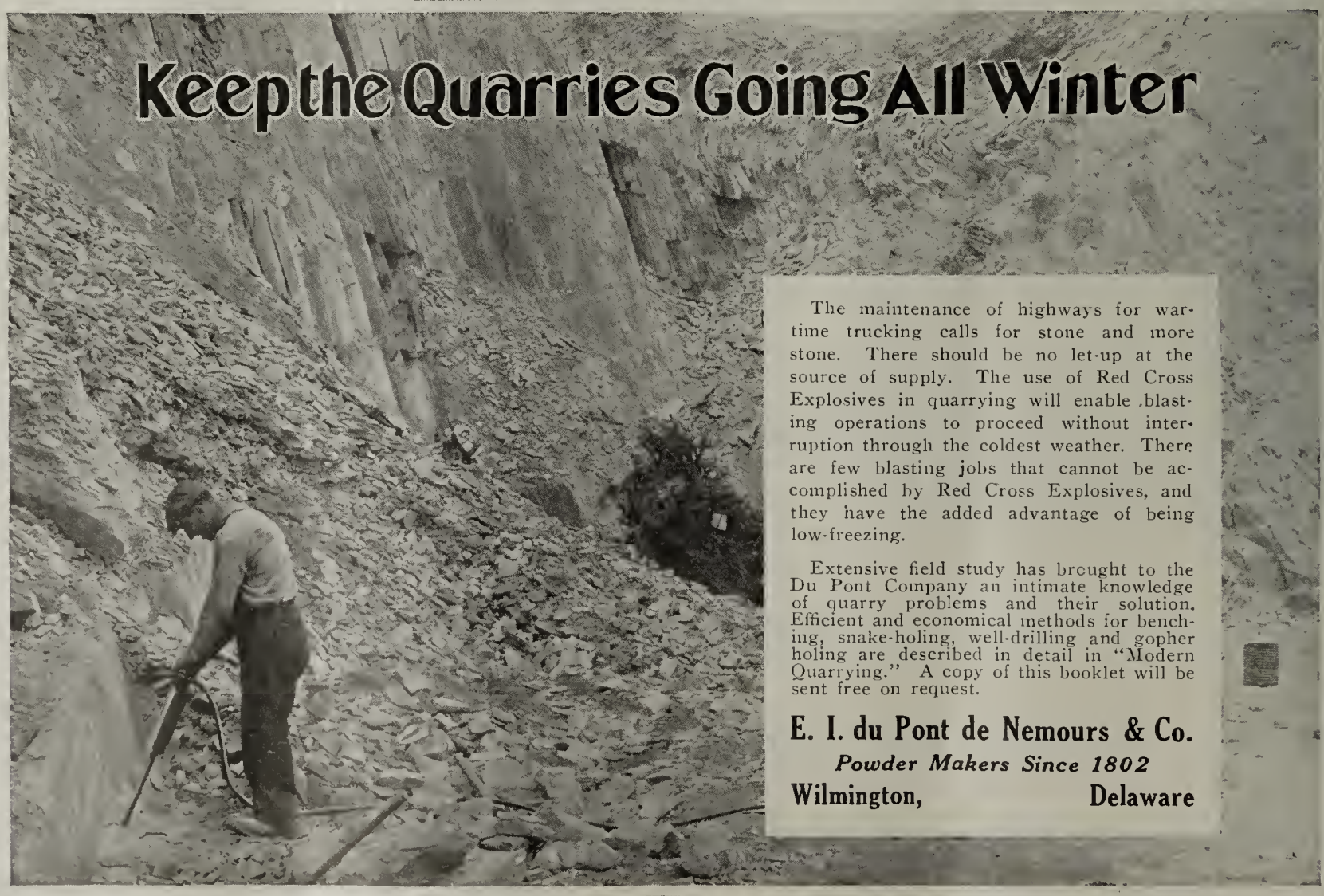
***We Build Crushers from 5 Tons to 300 Tons per 10-hour Capacity***

Instantly adjusted to produce size required from ¼ inch to 3 inches. *Write for Folder No. 14.*

**UNIVERSAL CRUSHER COMPANY**
230 Bee Ave Cedar Rapids, Iowa, U. S. A.



DU PONT AMERICAN INDUSTRIES

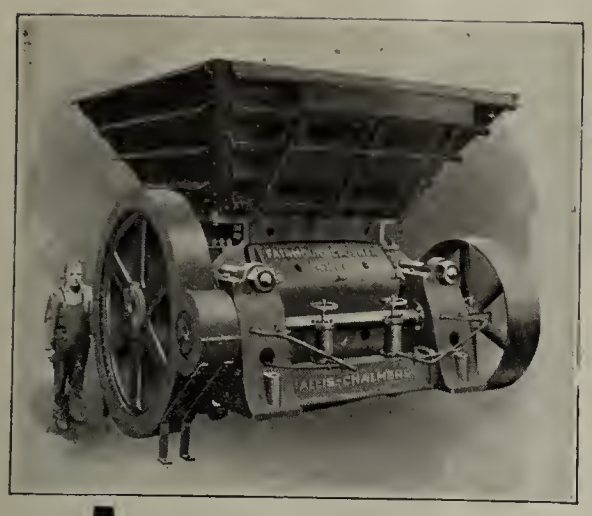



The maintenance of highways for wartime trucking calls for stone and more stone. There should be no let-up at the source of supply. The use of Red Cross Explosives in quarrying will enable blasting operations to proceed without interruption through the coldest weather. There are few blasting jobs that cannot be accomplished by Red Cross Explosives, and they have the added advantage of being low-freezing.

Extensive field study has brought to the Du Pont Company an intimate knowledge of quarry problems and their solution. Efficient and economical methods for benching, snake-holing, well-drilling and gopher holing are described in detail in "Modern Quarrying." A copy of this booklet will be sent free on request.

**E. I. du Pont de Nemours & Co.**
***Powder Makers Since 1802***
**Wilmington, Delaware**

DU PONT



FOR REDUCING { Limestone, Magnesite, Dolimite, Phosphate, Shale—or materials of similar hardness

# *Forcible Mechanical Discharge*

MAKES FAIRMOUNT CRUSHERS SUITABLE

FOR

STICKY AND WET MATERIALS

**Allis-Chalmers Manufacturing Company**

MILWAUKEE, WISCONSIN

Offices in All Principal Cities

**ALLIS-CHALMERS**

# For Facing Concrete Work

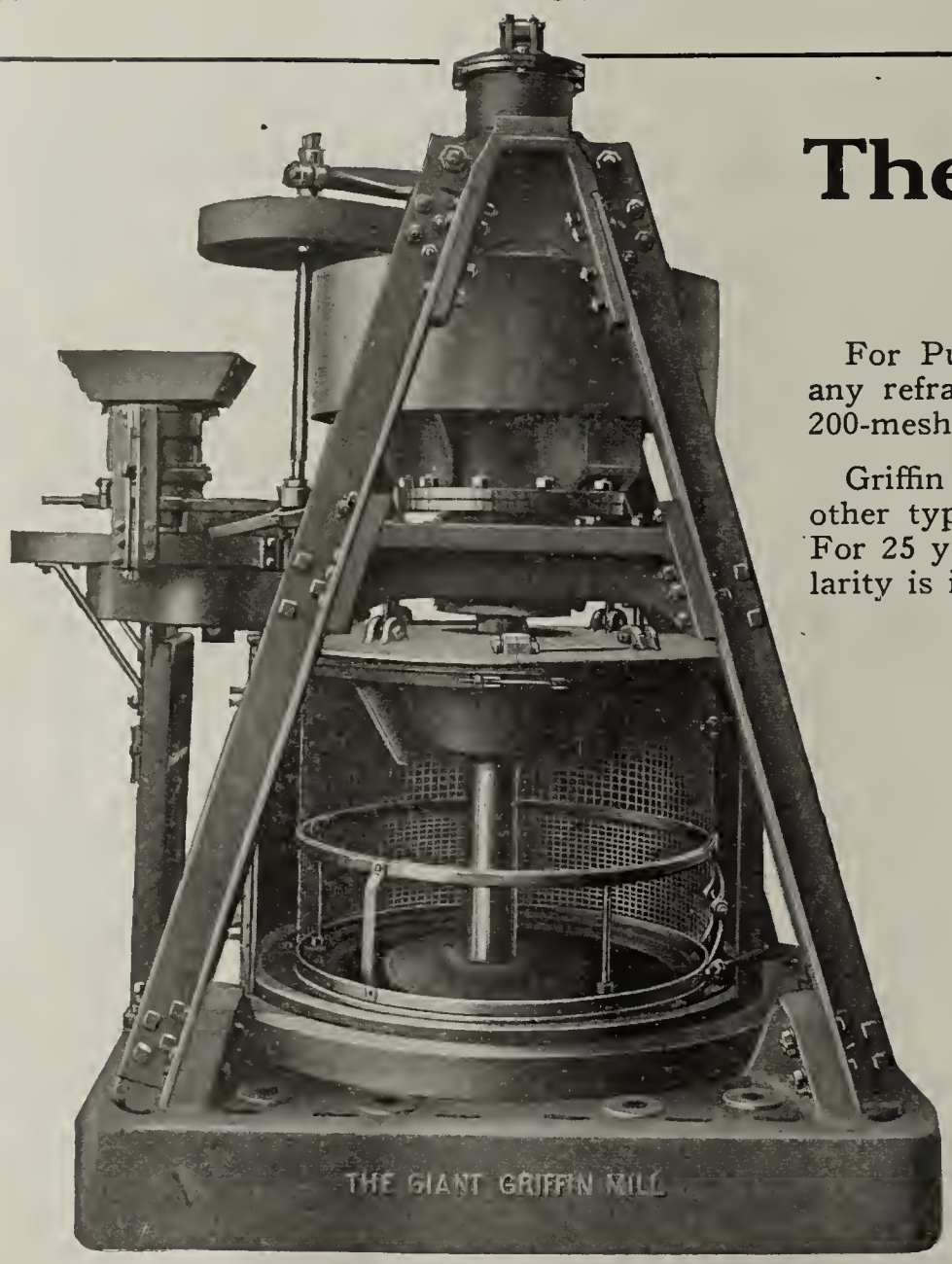
No other material can quite compare with Middlebury Terrazo. It is furnished carefully graded to size—in either dust, No. 1, 2 or 3.

It is made from Middlebury White and Creme Statuary Marbles; and when used for facing stucco work gives an appearance equal to that of solid marble, and with all the advantages of marble, at a material saving in price.

**Send for samples and prices.**

# Middlebury Marble Company

**Brandon, Vermont**




# The Improved Giant Griffin Mill

For Pulverizing Coal-Cement Clinker, Raw Material or any refractory material where a finess of 83% through a 200-mesh screen is required.

Griffin Mills are used by Cement Plants more than any other type of pulverizer. Now in operation in 45 plants. For 25 years they have led the procession and their popularity is increasing.

Recent improvements have reduced their former low H. P. and Maintenance Cost to the Minimum. Why not investigate this new Griffin Mill?

Recommended for Agricultural Limestone Producers as well as Cement Producers.

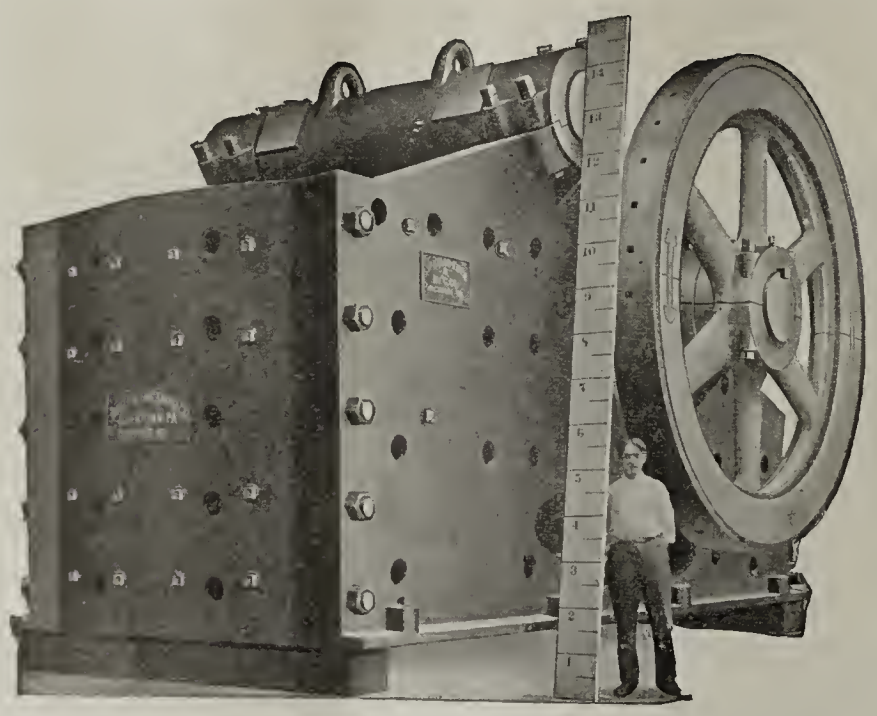
GRINDS ANY DRIED REFRACTORY MATERIAL.

Our Engineers Are at Your Disposal.

## Bradley Pulverizer Co.

**Works Allentown, Pa.**

**BOSTON** **LONDON**



Traylor 60"x86" All Steel Jaw Crusher

## TRAYLOR JAW CRUSHERS

**Are Built in All Sizes from 7″x10″ to 66″x86″**

The 66"x86" is the largest crusher built.

All Traylor Jaw Crushers have cast steel water cooled pitmans.

Extra size pitman and swing jaw shafts of finest hammered steel.

Chrome steel toggle seats.

Manganese steel or chilled iron jaw plates.

# TRAYLOR BUILT MACHINERY

## A CRUSHER FOR EVERY PURPOSE

***We Make***

In addition to **JAW CRUSHERS** illustrated

### The Traylor Gyratory Crusher

The last word in Gyratorys.

### The Traylor Crushing Rolls

They eliminate the personal equation in automatically preventing tire corrugations.

### The Traylor Tube Mills

Long or short for wet or dry grinding. Have water cooled bearings of extra size. Positive automatic feed that assures maximum tonnage for minimum horse power.

### The Traylor Ball Tube Mill

For reducing lumps to fines in one step.

## "THE ULTIMATE CRUSHING EQUIPMENT"

## TRAYLOR ENGINEERING & MANUFACTURING COMPANY

MAIN OFFICE AND WORKS: ALLENTOWN, PA., U. S. A.

NEW YORK - CHICAGO - LOS ANGELES - SPOKANE

# Cement and Engineering News

Vol. 30 Chicago, October, 1918 No. 10

Concreting Second Floor of an 800 x 100-Ft. L-Shape Three-Story Factory Building Surrounded on Three Sdes by Water and Obstructed by Railroad Track at Fourth Side.

## Rapid Concrete Factory Construction

### Foundations on Made Land; Water on Three Sides of Building

A three-story, L-shape, 800x100 feet concrete factory building constructed at Sandusky, Ohio, for the Hind & Dauch Paper Co. was built under difficulties both severe and peculiar. The building has brick walls on reinforced concrete framing, with flat slab floor construction using the S. M. I. reinforcing system, and with finished floors of concrete laid integral with the slab. The foundation, which consists of 600 concrete-filled Hercules steel piles, driven through made ground into bed rock, was installed by the Underpinning and Foundation Co., of New York. The ground was so soft that even under the dryest conditions it would scarcely support a heavy truck, and during the construction of the building it was necessary many times to use "Duck-boards" to float men and materials.

#### Delivery and Storage of Materials

The factory site is surrounded on three sides by water. The land end is crossed by several lines of railroad tracks, which complicated building operations considerably. The very limited space this left available made it important to use considerable care in planning and providing for the storage of materials. It was strictly necessary, in order to guard against delay from lack of materials, to purchase stone, sand, cement and steel in large quantities.

Stone in 5,000-ton batches, was delivered by barges which were quickly unloaded by means of clamshell buckets. Sand was handled in a similar manner. Cement was delivered in barges and was stored on them until used. Most of the steel was delivered by railroad

in two shipments; some rush shipments that were necessary were hustled in by motor truck from Cleveland, about 60 miles distant.

### Concrete Plant

The concrete plant included two towers about 110 feet high, one of steel and the other of wood. The steel tower was of the Insley type, equipped with a vertical sliding steel boom, through which passed the first section of the steel chute. The second section of the chute was suspended from the boom and was stiffened by an Insley counter-balanced truss. The lower sections of the chute were suspended from pyramidical wooden towers by tackles hung from overhanging caps on the towers. This arrangement afforded considerable freedom for shifting the position of the chute both horizontally and vertically. The chute was fed from a steel receiving hopper movable vertically on the face of the tower.

The wooden tower supported two hoppers from which concrete was spouted in two independent chutes. At one stage of the work concrete was spouted from the first or mixing tower to a hoisting bucket in a lower auxiliary or relay tower at the far end of the job, from which the concrete was spouted to place or to two-wheel carts in which it was distributed to beyond the radius of the chutes. In this case the chute was suspended from a cable stretched between the main and auxiliary towers.

Although both the steel and wooden towers were guyed at several points, and were considered to have ample strength and stability one of them was wrecked by high winds.

The mixers were served from large storage bins built above them. Sand and stone were elevated in cars on an inclined track, the cars automatically dumping into the bins. With this arrangement a pouring average of better than 1 cubic yard per minute was maintained.

### "Canadian Soldiers"

Considerable trouble was experienced from "Canadian Soldiers," a species of lake fly which infests this region during the summer, and is familiar to travelers on the Great Lakes. At intervals these insects, which are about an inch long, with large wings, were blown in upon the work in such swarms that they would pile up to a depth of several inches, ruining much of the floor finish and other concrete work, and making it necessary to do a large part of the work over again. Whenever operations demanded night work these insects became doubly annoying, being attracted in dense masses by the bright lights used.

The work was further handicapped by a constant shortage of labor and materials, due to war conditions. To overcome this, labor was reduced to a minimum from the time materials were received until they were placed in the finished building. Conveyors, industrial railways and the like were used wherever possible, and a novel system of forms was used which could be placed in units, and could be used repeatedly with very little cutting. The forms were so designed and placed that they could be removed without touching the main panel shores. The 20x20-ft. x 7½-in. floor panels were tested by the contractor who built a 6x6-ft. loading platform support on a 12x12-in. bearing in the center of the slab and placed on it an 8-ton pile of bricks that only caused a deflection of $\frac{3}{32}$ inch accurately measured by a very simple and sensitive multiplying indicator.

The general contractors were G. Wm. Deorzbach & Bro., Sandusky, Ohio; concrete work was done by the W. M. Sutherland Building & Contracting Co., St. Louis, Mo.; T. L. Wilkinson was chief of field staff for the engineers; the Indiana Bridge Co., Muncie, Ind., fabricated and erected all steel work.

## Magnitude in Present-Day Construction Work

Size and speed distinguish most of the present-day undertakings in the construction field. Contracting firms that four years ago would have looked upon a million-dollar contract as large are today as readily undertaking work that runs up into the tens of millions and are handling men by the thousand and material in heretofore unheard of quantities.

The following authentic figures regarding the largest destroyer plant in the world at Squantum, Mass., are, therefore, of peculiar interest. This plant, built by the Aberthaw Construction Company of Boston, for the Bethlehem Shipbuilding Corporation, Ltd., was started in October of last year and the work carried through to completion during one of the most severe winters that New England has ever known.

The site when the builders started work consisted of a marsh with a few areas of upland here and there that were slightly above high tide level. In order to make land on which to build buildings one and one-quarter million cubic yards of filling had to be deposited upon the land. About two-thirds of this quantity was dredged up from the harbor by the dredges which were forming the launching basin and channel that connects with the main ship channel. The remainder of the material was dug by steam shovels in various adjoining gravel pits. In order to move this amount of material a travel of 140,000 car miles was recorded.

Five thousand freight cars full of building material were brought to the job. The size of this can be gained if it is remembered that these cars placed end to end would reach from Boston to Worcester, and in addition to this 50,000 truck loads and team loads of material of various kinds was brought over the road.

Most of the buildings are built upon piles, about half a million lineal feet of wood and concrete piling being driven.

The steel framing of the buildings called for 11,000 tons. The area of the roofs of the buildings amount to 30 acres, and the perimeter of them is just under three miles. There is twelve acres of window glass in the job requiring 110 of putty to fasten it in place. Six miles of standard gauge railroad track were laid around the building and in connecting to the main line of the N. Y., N. H. & H. R. R. In addition to this two miles of narrow gauge track and four miles of trolley line to connect with the Boston Elevated Railway were put in.

The wood roofs and wharves and docks and temporary buildings called for a total of 10,000,000 board feet of lumber, the bulk of which was cut in the south. Thirty miles of piping were needed in order to take care of the needs of water and sewerage, steam, compressed air, fuel oil, sprinkler lines, fire mains, etc., and 16,000 sprinkler heads to protect the buildings from fire. 8,000 gallons of paint were needed for windows and steel and woodwork, etc.

For carrying through the great undertaking the Aberthaw Construction Company added quickly to their permanent organization enough men to make up a total of nearly 6,000. They have now under way for the same clients a far larger undertaking on the Pacific Coast that may eventually call for the work of 20,000 men.

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R. H. Beaumont Company, 460 Chestnut Street. Philadelphia, Pa., are mailing their new catalog No. 38, describing and illustrating the Beaumont Drag Scraper System for the ground storage of coal. This is an interesting booklet and will be mailed free of charge to our readers.

# Editorial

## 200,000 Men to Be Given a Collegiate Training by the Government

The Government is about to give 200,000 young men a college training at its own expense. Some 300 colleges will thus become akin to West Point, and the students in this new collegiate division will be enlisted privates, who will receive free tuition, board and lodging and $30 monthly salary. High school graduates, 18 to 21 years old, will be eligible, and apparently the Government plans to conscript nearly all the eligibles in the country for this collegiate division of the army.

This radical step is one that is likely to have a tremendous effect upon the engineering profession, for it is clear that practically all these students will be given a considerable amount of training in engineering. It is not unlikely that hereafter, instead of one West Point and one Annapolis, we shall have a hundred or more colleges in which young men will be given engineering and military training at the expense of the Government. Consider what is likely to be the outcome of such a plan. First, it will probably give the country 10 times as many enginering graduates annually as have hitherto been turned out. Second, it will focus the eyes of the entire country upon enginering education and the profession of engineering.

Engineers who look upon engineering as a narrow profession incapable of absorbing many more men without becoming overcrowded, will be apprehensive of their future. But engineers who believe that the demand for engineering services can be increased enormously, will have no fear. They will welcome this spectacular, radical departure from precedent, because it evidences a real public awakening to the worth of engineering. Of course, the great majority of future engineers will not be engaged as designers and draftsmen, but as managers of industrial and political affairs. For scientific managers there is a field without limit. But coincidentally with the entry of many engineers into managerial positions there will occur a greatly increased demand for engineers as designers and planners; for scientifically trained managers understand the power of applied science and seek its aid from every source. There are about 10,000 chemists and chemical engineers in America, and one-tenth of this entire number is now engaged on research work by one company—the Du Pont Co. What chemist would have dreamed of such a thing four years ago?

There are probably not more than 100 engineers engaged as city managers and mayors, but the 12,000 municipalities that now lack scientific management would alone absorb all the civil engineers who have graduated in the past twelve years, were those municipalities to choose trained scientists as their executive heads. With the rapid increase in the use of machinery in farming and the adoption of scientific drainage, irrigation, fertilization, etc., agriculture alone will absorb engineers by the tens of thousands annually, once there comes an adequate popular understanding of the benefits derivable from applied science—engineering.

Let none of our readers worry about the radical step that our Government is about to take in higher, scientific education. But let us all unite to spread the gospel of engineering efficiency in every realm of human activity.

## Plan Now for a Busy Winter

Cement products plants and concrete contractors with suitable shop quarters for winter work can keep busy practically the entire year. This is particularly true of those who make a specialty of cement staves, concrete building blocks and similar concrete units. All such contractors or manufacturers can accumulate during the winter a stock of material that will be ready for use at the earliest possible moment in the spring. With such a stock on hand these contractors have a good start over their less wide-awake competitors.

Barns, hoghouses, poultry houses and other farm buildings also are now being built of cement staves. The September issue of "The Concrete Builder," published by the Portland Cement Association, Conway Bldg., Chicago, contains interesting illustrated descriptive articles concerning barns and poultry houses of cement stave construction. These buildings suggest ways in which an enterprising contractor can make his business extend through twelve months of the year. The poultry house shown is 18 feet wide, 50 feet long and divided into two sections. One constitutes the laying room, the other the roosting room. The building has been in use three years and the owner proves that it has been an ideal poultry house because he says, "Before building my new poultry house disease sometimes carried away my whole flock of chickens, but since the new building has been used I have not lost a single one from disease. My hens lay on through the coldest winter weather."

Many kinds of concrete work are now carried on almost regardless of season and temperature. By observing a few simple and easily applied rules for preparing concrete mixtures, then using a few simple means to protect freshly placed concrete, a great deal of outdoor concreting can easily be done, and the resulting work will be just as successful as though carried on during more moderate weather. But there is lots of indoor work to be had for looking. Barn and stable floors are examples.

Concrete products plants should take advantage of present opportunities to keep their plants working throughout the year. A little expenditure of time is all that is necessary to fix up a room where the block or stave silo builder can keep busy piling up a stock of material ready for immediate delivery when a structure is wanted.

If you are inexperienced in concrete work in cold weather, write for our booklet, "Concreting in Cold Weather," which treats fully on the most approved methods to be used.

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## United States Was Marked for Plunder

The constant record of Hunnish pillage, outrage, and barbarity for the last four years, the brutality and treachery to the helpless and surrendered nation that has been exhibited in Russia, the collusion with its traitorous Bolsheviks, the treatment of all the weak neutral countries and the conditions that make Russian peasants burn their grain and starve rather than permit it to fall into the hands of the German

marauders, are all in line with the latest authoritative statement from Berlin that Germany requires an indemnity of $3,500,000,000 from despoiled Russia. Is anything more needed to convince every intelligent person in this country that from long before the beginning of the war the United States was marked for plunder by the world outlaw and that if he finds any strength or opportunity he will disregard as scraps of paper every solemn covenant that he may make to escape further punishment and only await an opportunity to levy tribute on us when occasion presents? There is but one answer to this question and but one possible course of action, namely, to silence every pacifist and other pro-German, complete thoroughly what we have already so well commenced, exterminating the last vestige of German military and naval power and dishonest commercialism and reduce all Germany to unconditional surrender by carrying absolute defeat to the heart of Berlin.

## War-Time Advertising

The following is an interesting statement issued by Hon. W. B. Colver, chairman of the Federal Trade Commission on the subject of war-time advertising:

"Discontinuance or even sharp curtailment of advertising because of temporary war conditions, would seem to imperil the most valuable asset that any business has—namely, its good will. No more faulty logic can be found than that which would impel a manufacturer to cease building for the future by means of advertising, simply because the output of his factory is for the time being, restricted; or because diversion of his facilities to war work has operated to withhold his goods from accustomed markets. In modern business there can be no sufficient unto the day policy.

"In advertising the business man has built up the intangible or spiritual side of his business, if such it may be designated, as distinct from the material side. It is the spiritual side as represented by the good will, that is slower of growth and that is the more seriously jeopardized by neglect—neglect which could take no more disastrous form than an interruption to advertising.

"Good-will in my estimation is far more valuable than the physical property with which it is linked.

"The manufacturer who has converted his factory to war work and has therefore interrupted the production of his original line, does not tear down and discard his expensive machinery to save the insurance premiums or other similar expenses. It would be just as sensible for a manufacturer whose commerical integrity is founded upon advertising to abandon his advertising campaign in order to save the carrying charge upon his greatest asset, good-will.

"They told me when I was a youngster that 'even the Lord can't make a two-year-old calf in a minute.' Big advertising spreads after the war will meet equally big spreads. Business will bid for public attention and interest on a bull market. The purpose will be to put a punch in good-will which has gone flabby. The man who goes into that contest with a public attention and interest which he has never allowed to relax will go in with his good-will trained to the minute.

"He will win."

## Preparing for Peace

The return of peace-times will, it is the hope of all, soon confront us. But no one expects the country's activities to drop back into their former paths. Changed economic conditions will be upon us. The world's markets have been depleted by war and there will be far-reaching trade adjustments.

There are those who have given expression to the thought that our present business is to win the war and until that is accomplished we may well dismiss from our minds anything else. No one can deny that winning the war is, and should be our chief business, but it would seem that we put unnecessary limitation to our efforts in closing our eyes to those things which we know in a comparatively short time must be met. How can there be any sound argument against making preparations that may be possible at the present time, the better to meet successfully the obstacles which we know will be in our path? In fact, it would seem to be the other way round. That rather than offer any excuse or argument for preparing for peace now, that criticism would be well deserved if such steps were not under way and being given consideration at the present time.

Now is the time to ask ourselves the questions: Are we preparing for peace-time? Are we ready to meet the conditions that will confront us? Are we studying to find out what these conditions are and what preparations should be made?

In the period immediately following the establishment of peace there will be a great readjustment of labor as it turns from the pursuits of war and war industries to those of peace. The inevitable result will be a period when there will be a large surplus of labor. The more provisions that can be made to absorb this, the less hardship will there be occasioned. Here surely is a definite problem well worth study and consideration. Whether we can see clearly at this time all that should be done to prepare for peace-times is no reason to disregard and put off those things that are clearly outlined before us and which are inevitable.

It therefore follows that whatever can be planned now that will help relieve such a situation, not only should be done but would be scarcely short of criminal folly to leave undone. Providing employment for labor is not only sound business sense but it is in the highest degree humanitarian, lessening as it does untold hardship and distress to thousands. It is not proposed here, even if it were in our power, to exhaust all possibilities that will make for sound labor conditions following the war.

There are, however, certain activities that stand out as pre-eminently worthy of consideration and support. Such are public works. There are few activities that rest on a sounder basis. They are the necessary foundation to the real progress of all communities. The present time should therefore be seized by public officials, civic and commercial bodies to lay plans for those public improvements which will add to the health, comfort and general welfare of their communities,

It has been necessary for the past year or two to postpone many much-needed public improvements, which must be resumed. But in addition there should now be considered plans for larger and broader developments.

Among all public improvements to be made and demanded, public highways open a field for greater possibilities than can be attained perhaps through any other public endeavor. The development of public highways carries with it the essentials to larger development by furnishing the necessary character of transportation which will make possible readjustment of rural and urban life, of agricultural and industrial activities, so necessary to the country's progress.

Highway work planned on a broad scale to be undertaken at the close of the war, would furnish employment to many thousands of men and would act as a balance wheel to keep labor conditions more nearly

normal. The nature of the work would make the demand for labor scattered and furnish wider spread assistance than is possible with any other branch of public work. Therefore, where the opportunity is presented to the peeople of a state, as is the case in Illinois and Pennsylvania, to vote upon and plan now for a comprehensive state highway system, work upon which would be ready to start at the close of the war, no effort should be spared to make it clear how much hinges upon the vote to be cast for these public improvements. At no time in the history of either state, or for that matter in any state, has there been presented to the voters a question of greater economic significance. And it becomes the duty of those who can look ahead and can realize how great is the responsibility placed upon the voters, to seize the present moment to spread broadcast information that will arouse the voters to take more than average interest in such matters affecting the welfare of the people.

## Don't Forget to Return the Sacks

Considerable has been written on the necessity for conserving sacks, and published in the columns of this journal. Lest we forget the appeals and warnings already issued and fall into a state of lethargy concerning this matter, again let it be said that "Uncle Sam" needs cotton ducking in large quantities for war purposes. Indeed, it may be stated that this material is just as important in helping to win the war as any munition.

There is said to be a shortage of cotton ducking. Naturally this shortage means much to the boys "over there." You can help them "over the top" by saving the sacks.

Do not permit bags to be left out in the rain or in any way to become wet, thereby rendering them useless.

Do not permit employes to use bags to make aprons, shirts, feet protectors, and so forth.

Do not permit carelessness on the part of employes whereby bags become lost or stolen.

Do not forget to return bags promptly to your dealer.

When you needlessly hold a cement bag, a new one must be made to take its place. You can help save the material and labor used in the manufacture of bags by returning the empty ones without delay.

Above all, impress upon your men the importance of taking good care of the bags and returning them to the dealer promptly.

## Substantial Highways a Vital Need

If the war is to contiue for any length of time, motor truck transportation must be largely extended and increased, as it has been demonstrated that in the matter of transportation there are limitations beyond which the railroads cannot go. This cannot avail unless there are built between the principal manufacturing and shipping centers substantial highways which permit the employment of motor trucks.

The time in which this work ought to be done is right now. If the construction is not within the financial capacity of the states through which these highways pass then it should be done by national funds. In our opinion, the Chamberlain-Dent bill should be passed by Congress, as it would give needed authority and money to the Secretary of War, who could then designate certain roads to which federal attention could be given.

In some of the state legislatures now in session misdirected efforts are bing made to establish prohibitive taxes on trucks. Whatever sums are sufficient to strengthen our highways as to carrying the heaviest military loads safely and without serious destruction to the roads should be appropriated at once out of state funds and federal co-operation sought of Congress. It is just as much. in our judgment, the business of the Government to build good roads as it is to build good muskets or good cannon or to furnish proper equipment to its army. Of course, federal funds should be placed on roads of national importance, and highways possessing a special military value come under this head at the present time.

This country can no more do without properly and adequately built highways than it can do without properly and adequately built tonnage for ocean travel. The country should impress upon Congress the importance of this matter. Of course, the expenditure of money on the highways would be for the benefit of those who use motors. That is right, because it is by the use of motors that we are going to be able to transport thousands and thousands more tons of commodities, materials and products of all kinds that are absolutely necessary to maintain this country at the point of highest efficiency in its determination to win victory and substantial democracy, not only for its own people, but for all the people of the earth.

## Gouge Soft Spots Out of Concrete Pavements

In laying concrete pavements, after the top has been surfaced and left to harden but before the covering of earth is thrown on, a careful inspection of the surface should be made. By the time the concrete has set long enough to sustain a man's weight without showing, small bright and shining spots will be seen on the surface. They may be few and far between or there may be a great number of them. If the inspector will insert his pocket knife into these bright places he will find them soft in comparison with the rest of the surface. It will be found that these soft spots are earth or some kind of clay or loam, or a lump of sand, wood, coal or soft stone. All this soft material should be dug out, the holes cleaned and then filled with fine and rich concrete, filling the holes a little more than full. In spite of all the care possible in providing clean and pure material, it is impossible not to have some foreign matter get into the concrete, and the adoption of the foregoing kink will prevent many a hole in the surface of a concrete pavement, especially if the stone constituent of the concrete is gravel.—Walter E. Emery, Supt. of Highways, Peoria, Ill., in Concrete.

## Sand-Lime Brick in 1917

According to the United States Geological Survey, Department of the Interior, 187,546,000 sand-lime brick, valued at $1,420,330, were sold in this country in 1917, a decrease of 39,798,000 brick, or 18 per cent, and of $53,-743, or 4 per cent, compared with 1916. The decrease was due principally to the general decrease in building operations but in part to scarcity of labor and difficulties of transportation. The value of the output for 1917 was greater than the value of that for any other year except 1916.

Sand-lime brick were made in nineteen states by forty-seven operators. Michigan was the leading state and reported more than one-fourth of the output and value, and Minnesota was second. Common sand-lime brick represented 98 per cent of the total output and value. The average price per thousand for common sand-lime brick was $7.54, an increase of $1.11 over 1916.

## Highway Freight Lines Developing Rapidly

The tendency in transportation towards a greater use of the highway is clearly shown by the large number of highway freight and express lines now organizing and by the inducements offered to shippers by companies already organized and in service.

A motor truck line from Detroit to Pontiac, Mich., is operating over concrete roads in Wayne and Oakland counties in that state. The distance covered is 25 miles. The Wayne county section of this route was built by the Board of Road Commissioners with Edward N. Hines in charge as chairman of the Board. A line between Detroit and Toledo is also organizing.

Mention has already been made of the Baltimore-Washington express where 5-ton trucks with two 5-ton trailers each are operating. The development of tonnage for highway freight lines forms an interesting parallel to the growth of traffic where roads have been rebuilt. In the case of the Baltimore-Washington line the business grew so rapidly that orders were placed within six months for duplicating the equipment.

A motor truck freight line between Buffalo and New York has been organized under name of The Empire State Motor Transport Lines, Inc., and is expected to begin operation soon. In view of the populous and prosperous region this line will serve it would be hard to estimate the amount of business which will be offered almost simultaneously with its opening.

As expected however, the full development of these new aids to transportation depends upon the road. The stronger and harder the road the larger the load, and larger loads mean greater profits.

Concrete meets all requirements. It is hard, durable, unyielding and altogether satisfactory.

## Hydrated Lime in Concrete Roads

A new bulletin entitled "Hydrated Lime in Concrete Roads" just issued by The Lime Association, Arrott Bldg., Pittsburg, gives the results of the first test that has been conducted to show the effect of hydrated lime in concrete when placed under actual field condition.

The effect of the hydrated lime seems rather remarkable, but when one considers the detrimental effect that excessive quantities of water have on the ultimate strength of concrete and that any decrease of excess water manifests itself by an increase in strength, the results are quite logical.

The increase in strength can undoubtely be assigned to two reasons:

First, as the hydrated lime was increased, the flowability and workability of the mixture was improved to such an extent as to permit it being placed with a lesser quantity of mixing water than that required for the concrete without lime.

Second, hydrated lime is of an hygroscopic nature and absorbs water at the time of mixing. This water is held mechanically by the lime, but it cannot be utilized in any chemical combination while the lime is hardening. The cement, however, has a chemical attraction for moisture during the seasoning period which is much stronger than the mechanical attraction of the lime. The moisture is therefore drawn from the lime and utilized by the cement in the process of more nearly complete hydration, thus resulting in increased strength.

With these two statements the increases in strength shown are explained. The Highway Department of Delaware are large users of hydrated lime in concrete, hence the reason for their conducting the investigation.

**No Traffic too Heavy, no Weather too Bad, for the Well Built Concrete Road, Like the Sections of roadway Shown Above, Located in Marion County, Indiana.**

Other facts relting to the field test are embodied in the booklet and we are confident that with the steadily increasing interest being shown in this subject the engineering profession, together with all others interested in concrete construction, will be only too glad to see the matter covered in your columns if you can see your way clear to do so.

Your particular attention is called to the statement from the Spackman Laboratories, where the specimens were broken, that failure of the coarse aggregate occurred in every case.

As mentioned above, this is the first test published on this subject which indicates the performance of hydrated lime in field practice, and this makes the information so much more valuable. It has been the contention of those who have closely studied this subject, that the true value of hydrated lime in concrete is not so pronounced in laboratory work, the reason for which is fully covered on the last page of the pamphlet, but, in field practice, the conditions being vastly different than in the laboratory, the possibility for improvement is much greater, and a material having the properties of hydrated lime has a much better opportunity to do its work. Write the Lime Association, Arrott Bldg, Pittsburg, Pa., for a copy of their bulletin—Hydrated Lime in Concrete Roads.

# How Block Men Work Together

By F. R. Zimmerman

(Secretary, Concrete Block Manufacturers' Association, Milwaukee.)

For several years the concrete block manufacturers of Milwaukee have felt the need of co-operation; and the need has been mohter of a hope that some day an organization of real value might be permanently maintained.

Our first efforts were local; that is, the South Side an dthe North Side held separate meetings. Later a city-wide effort was made; but as nothing was done between meetings, the only good to result at all came to those who attended these meetings. The officers were all manufacturers, who had troubles of their own and could not be expected to devote much time to the welfare of the other fellow's business.

Our last efforts at an association was started last summer, when a secretary, who, until that time had been in the block and material business, was engaged and he has since spent all his time in the interest of the block manufacturers. The high cost of materials, labor and other troubles of the past year have closed about 50 per cent of our thirty-five block plants here, and doing things has been difficult, but we have accomplished something. Howveer, so much more is on our program for the future that what we expect to do rather than what we have already done, will make the best reading.

During the several months that it takes to get an association started, the members who make demands upon the secretary are the ones to whom the association first is of value, and the sooner the needs of all the members become known, just so much sooner can the secretary work out their problems.

The secretary should act, first of all, as a credit man for all the members, and in furnishing credit reports, he renders the greatest possible service. This end of the association is one of most importance, and when working right will reduce slow accounts, poor accounts and losses.

The secretary can also furnish manufacturing costs and determine overhead expense. It is the small expense that is forgotten, and we thus deceive ourselves, believing much to be profit which in reality is spent before the blocks are out of the yard, sometimes spent before a block is made.

By visiting all the plants, the secretary can determine the best methods of handling materials, and a few changes in an old plant and a suggestion for a new plant would be of real value. Visiting every plant, he become familiar with various machinery and can give the experiences of each manufacturer. He might also act as agent for block factory equipment.

Systematic advertising should come from the secretary's office, and this should cover the block business generally, and make no reference to any one plant.

"Build with concrete blocks," is our slogan and we use it whenever possible, in our mail, our advertising and our conversation.

The manufacture of a concrete block that is a perfect building material should be the aim of the manufacturers, and every block should be made good enough to permit its use in every building. Blocks should be so much alike that long hauls might be eliminated, a south end man delivering a job that belonged to a north end man, and vice versa.

The city building inspector should be assisted by the association secretary and the secretary assisted by the building department to demand that blocks be made strictly according to an established city building code. Concrete blocks must be made so good that they become the standard by which every other building material is measured.

The city building inspector should be given authority over a territory large enough outside the city so as to keep suburban buildings up to the requirements of the city code. Adjacent territory is soon annexed and buildings in it should be put up under restrictions, so they will not become a fire menace when the territory becomes a part of the city.

Manufacturers should be required to take out licenses and furnish bonds, as a guarantee both to the owner and the municipality.

Perhaps more can be suggested that will make associations and secretaries a benefit, but nothing will ever be accomplished unless the members themselves are interested, unless they do good work, get a legitimate profit, and learn to consider a competitor an associate. Let men remember that sauce for the goose is sauce for the gander. No longer should we urge competition as the life of trade, but co-operation, as the only means of doing honest work at an honest price. Block failures should be proof enough.

Finally, the secretary's salary. There is danger that members in failing to pay their share of the association expense, will soon make it necessary for the secretary to spend most of his time getting his salary. The most equitable method of meeting expenses seems to be the payment of an agreed amount on each block sold or made. At the close of the year, should a greater amount have been paid into the association than was required for operation, a surplus fund would be encouraging, but the members might be repaid in proportion to amounts paid. There can be no more uniform method of meeting expense. It means big business, big expense; small business, small expense; no business, no expense.

# The Use of Concrete Work on the Farm

**Contractors Can Make Good Profits in Constructing All Types of Concrete Buildings.**

Progressive contractors and builders doing business in farming communities have long since been convinced that concrete on the farm has come to stay. The man who years ago confined his activities to foundations and floors is now busily engaged in building complete structures of concrete and specifies this material wherever he can. The farmer is being educated to appreciate the fact that the first cost is not always the most important and that it is essential to have structures that are permanent and require practically nothing for maintenance. There is not a single farm building that cannot be constructed of concrete and steady progress is being noted in the use of concrete for farm residences. Numerous opportunities for profitable business await the contractor who will familiarize himself with the many features of concrete as they are suited to the needs of the farmer.

A close study of the requirements for all classes of buildings will soon stamp the contractor as a specialist in this line and his experience will qualify him to make valuable suggestions to his clients. This is the season when the farmer is financially well to do and is thinking of farm improvements. Suggestions are presented in the following pages covering a wide variety of buildings and also miscellaneous work that can be done at a profit. The illustrations and detail drawings are good examples of modern practice and demonstrate the opportunities for business building in the rural districts.

The contractor who will give serious consideration to the value of concrete construction on the farm may rest assured that he can fortify himself with many convincing arguments that will impress the prospective builder. While some farm structures have been built of concrete as cheaply as frame, generally speaking concrete calls for a larger investment. It should be remembered, however, that bad weather does not weaken its construction or appearance, and these features, coupled with the annual ecenomy, effect a saving that practically eliminates any difference in first cost between concrete and frame work.

Concrete can be used on the farm for residences, barns, poultry houses, garages, piggeries, stalls and mangers, milk houses, machine sheds, ice houses, silos, all kinds of tanks and troughs, vats and wallows, manure pits, septic tanks, piers and foundations, sidewalks, steps, driveways, hen nests, pump pits, fence posts, etc.

An Excellent Example of Barn and Silos Built of Concrete Blocks.

Opportunities are not confined to new buildings, for conditions often exist where structures are in a fair state of preservation and well worth saving. Decaying foundations and faulty floors can be replaced with concrete, while cement plaster or stucco makes an attractive and satisfactory covering in the rejuvenation of old buildings. Lasting results will be obtained where close attention is paid to the aggregate and the materials proportioned accurately.

If one may judge from the demand and the variety of uses to which it is put, the concerte block is the most important of all cement products. When properly made it has not failed to give satisfaction as a

**Concrete Helps to Make the Cows Contented.**

building material and much of its popularity has resulted from the pleasing architectural effects that have been brought about. Hollow blocks represent a considerable saving in cost, without reducing the strength so as to impair the safety of the building. The use of facings to bring about pleasing exterior treatments has its advantages, while the interior air chambers allow them to conduct heat or cold but slowly. This fact makes buildings of this material warm in winter and cool in summer and tends to prevent sweating of walls.

The curing of blocks is one of the most important points in their manufacture, for carelessness in this process is likely to undo all that has been previously accomplished by careful proportioning, mixing and forming. Concrete block walls may be built without forms, the work being simple and the knack of doing neat and rapid work is not hard to acquire. Residences and garages may be built of these blocks at low cost, being in no sense cheap, having good lines and well adapted to construction on the farm.

Of all the buildings on the farm which should be built of concrete, probably none is more important than the silo. Here is a structure in which it is essential to keep the silage fresh in order that the stock may be kept thrifty and growing all winter. The silo prevents a waste of corn stalks which contain about one-third of the food value of the entire crop, and it enables a large number of animals to be maintained on a given number of acres. The concrete silo is ratproof, windproof, fireproof and will withstand cyclones. It will not dry out in the hot summer months, keeps the silage in perfect condition and can be constructed at a moderate first cost. There are four types of silos—monolithic, cement block, stave and cement plaster construction. It is impossible to lay down a definite plan for the construction of a silo, but the accompanying drawings illustrate a good type of building which can be put up for a moderate sum. In doing the work a good proportion of concrete mixture to use is 1:2½:5 for the foundations and a 1:2½:4 mix for the walls above grade. Capacities vary according to conditions, while the type of construction is largely a question of individual taste. Whichever type is adopted will be found eminently satisfactory and will prove the most economical method of supplying food for the stock. A number of concrete silos in different sections of the country are illustrated herewith.

The ease with which concrete can be kept in a sanitary condition makes its use especially desirable in dairy barns. Concrete floors can be flushed daily in short time and without expense, while concrete stalls and mangers have many features from the standpoint of cleanliness, accessibility, etc. Stanchions always have a solid foundation when installed in concrete and no trouble need ever be feared from their becoming loose. A barn built of concrete can be maintained at an even temperature throughout all seasons of the year. The concrete hollow block is probably most commonly used in this work but monolithic walls furred, lathed and plastered on the inside have also given excellent satisfaction. A few years ago even our more progressive farmers were skeptical regarding the practicability of the all-concrete barn, but with the fact that many have been constructed and are successful in operation is a conclusive indication of their growing popularity. A particularly fine example of a concrete barn and two large silos built of concrete block is reproduced in an accompanying illustration, while details are also presented of a concrete barn design and dairy barn floor.

The introduction of concrete in and about the hog house has been productive of excellent results, both by improving the conditions under which the swine are housed and fed by making possible a saving in labor, maintenance expenses and feed. In the Corn Belt states, especially, concrete floors are used almost exclusively for both sanitary an deconomical reasons. The manure, particularly the liquid manure, is saved

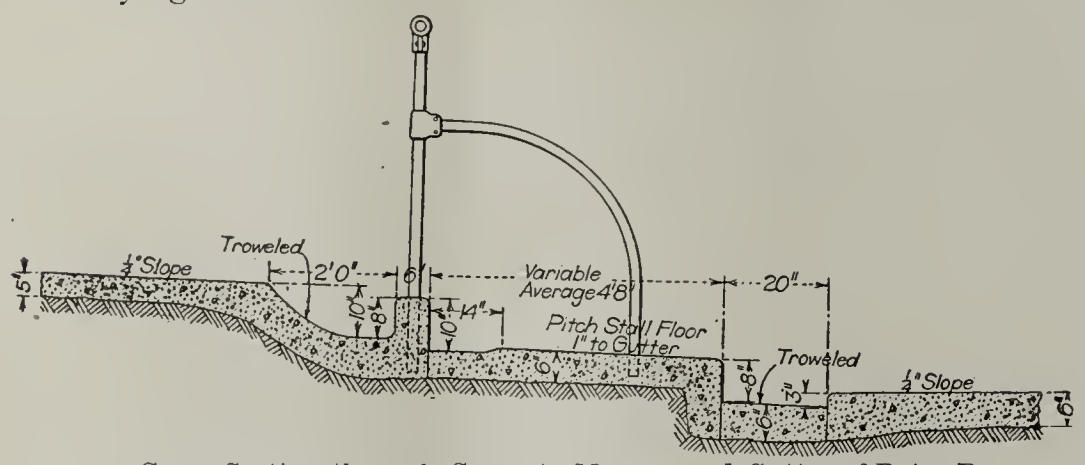
on the concrete floor by bedding, or else through drainage into a gutter and to a manure pit. A concrete floor and a barnyard so arranged as to save all of the liquid manure which contains so much valuable fertilizing material was laid by the Ohio Experimental Station some time ago, and a careful comparison made between a herd of cattle kept upon this floor and another herd which was kept on a well packed earth floor, to determine the saving effected by the concrete floor in the value of manure. The saving during the first six months of its use paid two-thirds of the cost of the floor.

Concrete is used successfully for hog troughs and dipping vats, while it is a good plan to provide a cob burner in connection with a hog feeding floor, to dispose of the cobs which would otherwise litter the floor or the yard. Such a structure protects adjacent buildings from fire and saves the charcoal from the cobs, which is of great value to the hogs.

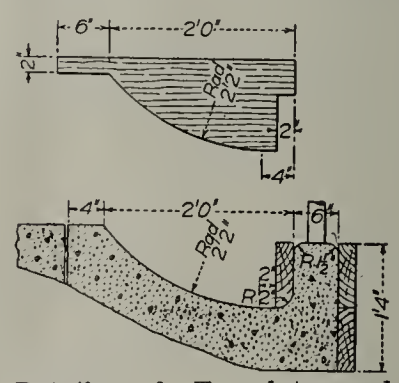
The concrete hog wallow is an improvement which every hog raiser should consider a necessity. The hogs find great satisfaction in being able to lie down in the water, excepting in quite cold weather, and the wallow proves a very practical scheme for killing vermin when a quantity of crude oil or other disinfectant is put in and the intake and outlet stopped. The wallow should be located near the water supply, and it will be found convenient to make the pool rectangular with rounded corners. A concrete floor around the wallow prevents the hogs from burrowing or carrying in mud.

**A Concrete Block Milk House.**

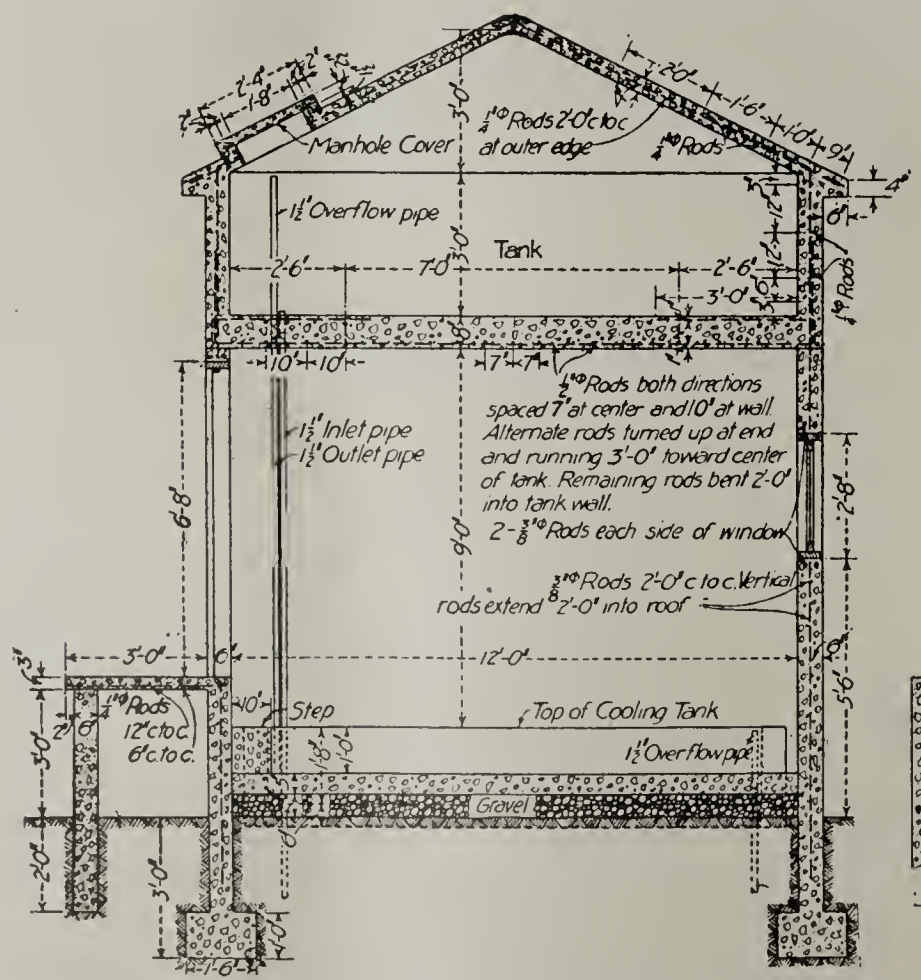
What has been said regarding concrete for piggeries is also true in connection with poultry houses. Concrete buildings contain no crevices in which to harbor vermin, and this freedom from lice makes it



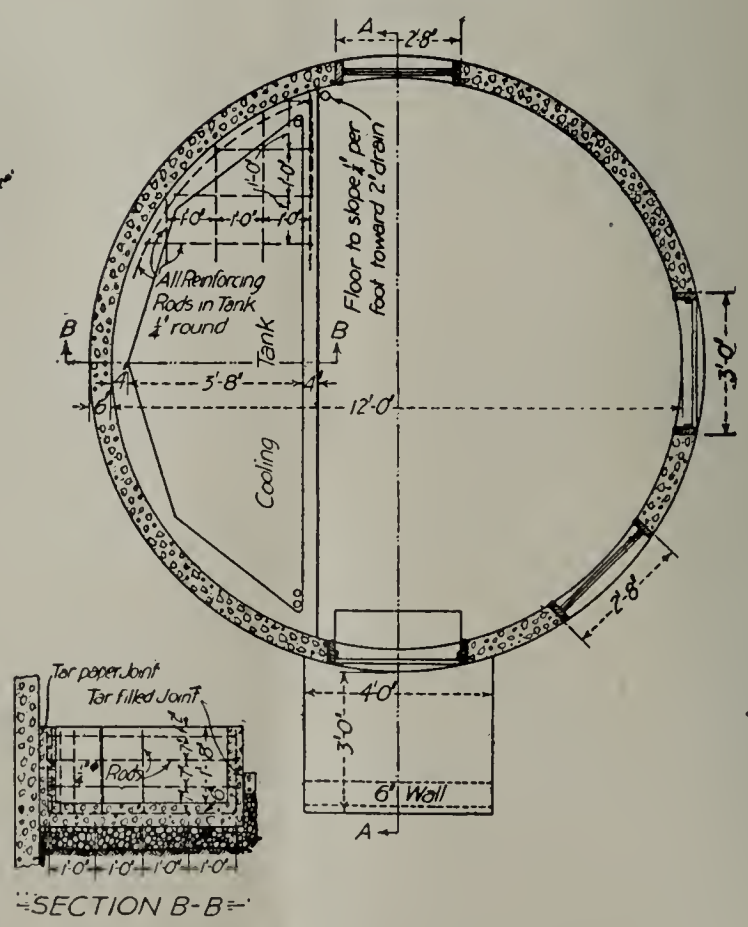

Cross Section through Concrete Manger and Gutter of Dairy Barn




Details of Template and "Form" for Manger and Gutter




Vertical Cross Section of Ice House on Line A-A of the Plan




Plan of Ice House Scale 3-16 in. to the Foot

Details of Cow Stalls and Manger; Also of Concrete Ice House.

possible for the birds to retain more flesh at the end of the setting period and therefore more strength. Poultry can withstand dry cold when housed, but cannot endure dampness or drafts from below, and a concrete floor will also keep out rats. Instances are known where concrete is used successfully for nests, dropping platforms and roosts, thus greatly simplifying the problem of cleaning.

The first requirement of a milk house is that it be scrupulously clean, and the construction should be such as to eliminate breeding places for germs and cracks or crevices for the dirt to collect, making cleaning difficult or impossible. A milk house properly constructed of concrete fulfills these requirements, and concrete floors are recommended for sanitary reasons, with proper provisons for draining. The milk house should be located with reference to other buildings, such as stables and manure pits. In the State of New York it is a law that, for certified milk production, milk houses be at least 100 feet away from such buildings. Cooling tanks and ice rooms can be planned according to requirements. Accompanying drawings show a modern milk house, complete with tank, a type of work which is simple to construct and will appeal to the farmer who is anxious to have a modern building in which sanitary conditions will be unexcelled. A point of unusual interest to the builder is the proper mixture of concrete to use. For the foundations it should be a 1:2½:5, for the walls above grade 1:2½:4 and for the floor and the cooling trough a 1:2:3 mix is used.

With the increased use of gasoline engines and other equipment on the farm, concrete makes an ideal foundation for engines, cream separators, etc. A simple foundation for such work may consist of merely a block of plain concrete, resting on a firm sub-base, with anchor bolts properly set, by means of which the equipment is held in place.

In buildings, such as ice houses, where it is necessary that good insulation against heat be provided, double or hollow wall monolithic work is often preferred. Double wall work, as the name implies, consists of two entirely separate walls, with an air space between. To construct double walls of the monolithic type a special wall form is required unless the air space is sufficiently wide to accommodate two single wall forms, back to back. For maximum effi-

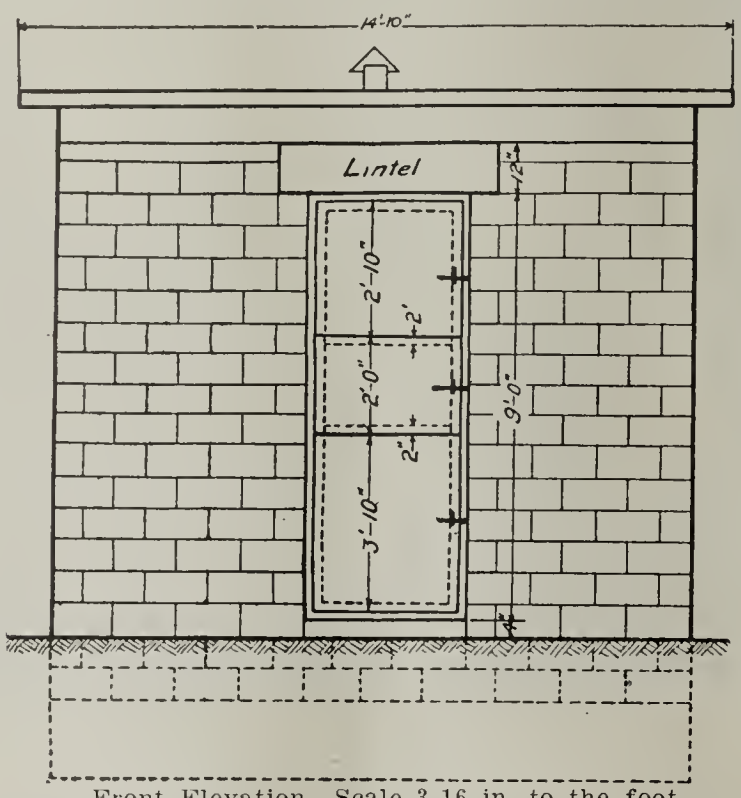
Concrete Water Trough.

Building a Concrete Silo.

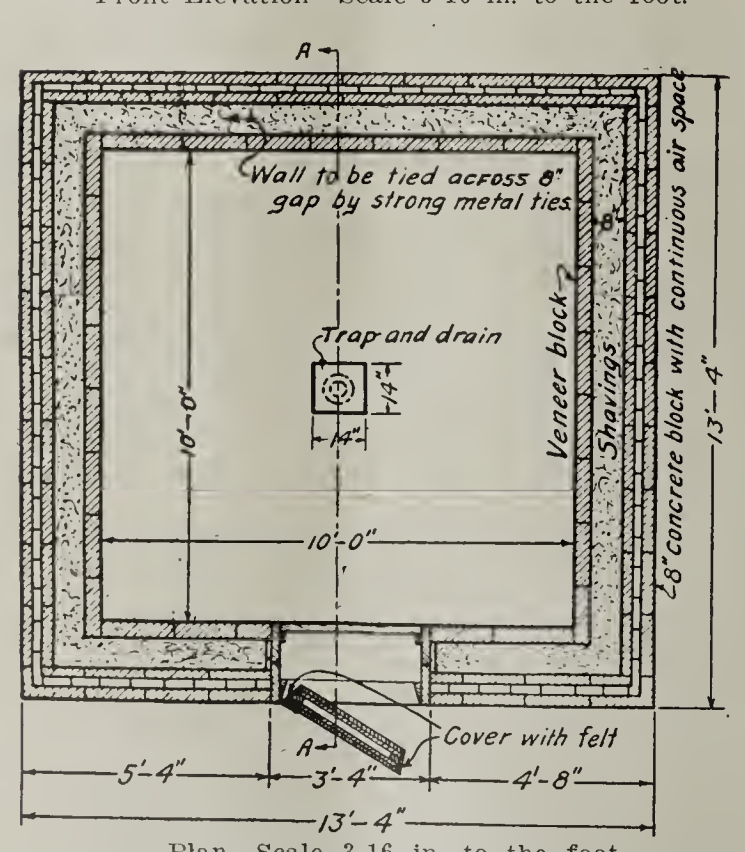
A Typical Farm Scene—A Concrete Barn, Silo and Watering Trough.

ciency the hollow blocks should be of the continuous air type and the inner and outer walls tied together with metal ties placed at frequent intervals. The concrete ice house is a good investment and the additional expense over other types of construction will be entirely compensated for during the first few years by the lower cost of upkeep. A good type of concrete ice house is shown in the accompanying design and details of a building where an 8-inch continuous air space block is recommended for use.

Providing a satisfactory storehouse for corn is a



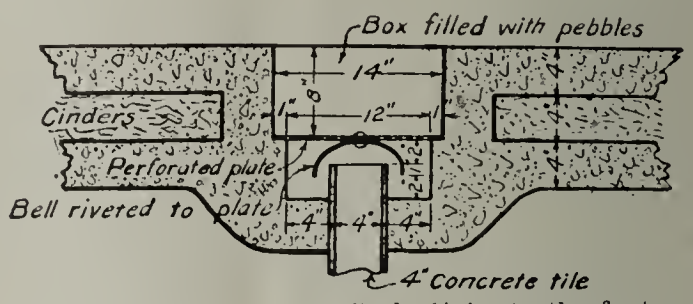

Front Elevation—Scale 3-16 in. to the foot.



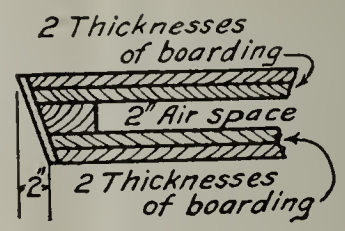

Plan—Scale 3-16 in. to the foot.

farm implements are kept in a good, dry house and otherwise cared for when not in use, their usefulness can be greatly increased. The question of implement and wagon sheds is an important one and they can be designed according to local requirements. The use of concrete in this connection should not be overlooked, as structures of this type are not expensive. It may be found economical to build them of concrete blocks, for the building need not be very high, floor area being the main consideration in laying out the work.

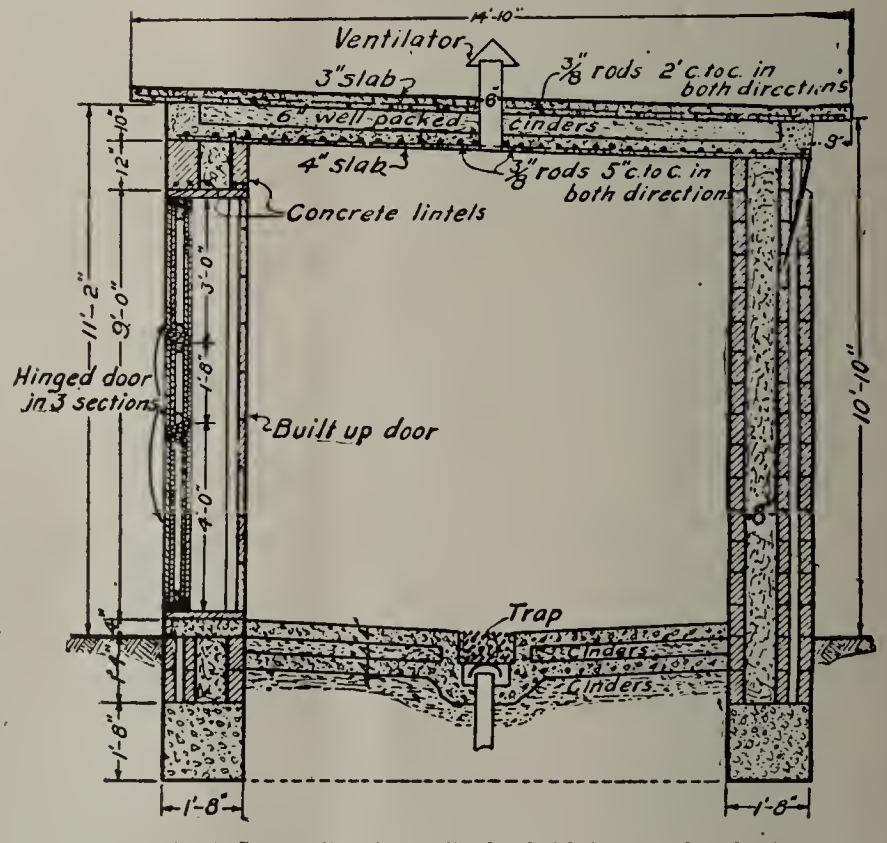
In most of the Northern states root cellars are com-




Section through Trap—Scale ½ in. to the foot.




Partial Horizontal Section through Door—Scale ¾ in. to the foot.




Vertical Cross Section—Scale 3-16 in. to the foot.

**Plan, Elevation and Details of Concrete Block Ice House.**

live question with every farmer in the corn belt. Experience has proven that corn will keep indefinitely on a concrete floor, if the crib is properly constructed. It will be found advisable to have a concrete foundation in this work, a concrete floor above grade and at least three or four feet of concrete above grade to keep out vermin. Where floors are made crowning or to slope toward the outside, water will drain easily, while a free circulation of air will assure the proper curing of the corn.

Machinery depreciation on many farms is exceptionally high simply because of the fact that sheds are not provided wherein to house the equipment. If monly used for storing potatoes, turnips, and other vegetables from the time of gathering until marketed. Fruits are also stored as well as roots for the winter feeding of cattle. Concrete is used in building these cellars, and they are often constructed below ground level. Concrete is valuable in this instance because it will not rot out and requires no expenditure for repairs.

Concrete is an excellent material for building troughs and tanks, in that they are easily built, are permanent, water tight, cheap in first cost, and will not fall to pieces or absorb water. Because of the

Circular Watering Trough of Concrete.

simple forms required and the ease with which they are constructed in various sizes, rectangular tanks are often preferred, sizes and capacities depending on the amount of stock to be accommodated. Because of its shape a circular tank will resist frost action more perfectly than a tank of any other form, and is the most economical in material for its capacity, yet the forms are more difficult to construct and the work is more expensive. The contractor who could induce a number of farmers to use tanks of the same diameter would lessen the average cost in the use of one set of forms for all receptacles. Concrete tanks have the advantage of sanitation and are easily kept clean, especially where round corners are provided. A smooth surface is desirable on both the inside and outside of tanks and may be obtained by tapping the form as

Two Silos of Solid Concrete Construction.

Showing How Concrete Fence and Corner Posts May Be Used.

the concrete is deposited, an operation which assists in expelling the air and causes a better distribution of mortar on the surface. Concrete has been found effective in the construction of cisterns, and for purifying water a concrete filter bed in a concrete tank may be used to advantage.

There is no greater menace to the health of a community than the common privy, and the construction of concrete septic tanks is an opportunity that should not be overlooked by the progressive contractor. A septic tank system is a great convenience for the farm residence and in addition also prevents the contamination of water supply. Reinforced tanks are easily and inexpensively build, and one good system installed in a community will pave the way for future business.

Mention should also be made of the value of concrete for waste water receptacles, scale pits, curbing

A Concrete Manure Pit.

A Concrete Block Ice House.

Interior View of Dairy Barn.

for old wells, pump pits, pergolas, grape arbors and fence posts. There is an exceptionally wide field for concrete fence and corner posts in that they will not rot, burn or corrode, will hold fence wire securely, and will not heave from frost nor pull up easily from line tension when the fence runs across a hollow. No painting is necessary and the posts are permanent. Considerable work of this character can be done when times ordinarily are dull, workmen kept busy and profits made and confidence established with the farmers for future business relations.

## Good Track Facilities in Products Plants

Hours of time each week or each month are lost in some concrete products plants through faulty car or track facilities. Frequently a plant is well equipped with machinery and steam curing rooms, and will have good supervision, but the maximum efficiency is not obtained on account of some weakness in the trackage facilities. This is especially true in many plants with transfer car and transfer track. A very heavy transfer car is preferable, one which will not spring or waver under the weight of a heavily loaded car. The transfer car should be run on a track which is as nearly rigid as possible. If the transfer track is not exactly level, there is always difficulty in stopping a loaded car at the proper place on the transfer car and difficulty in keeping it properly placed during the transfer.

If great care is taken in the adjustment of the transfer track much time will be saved in plant operation. A heavy rail is preferable. Some manufacturers who devote particular attention to the transfer track are using a 60-pound railroad rail laid on a firm footing. This is properly leveled up and keeps the transfer car in the same position at all times, and the car is operated through the transfer without the loss of time so frequently seen where the transfer track is carelessly located.

## Builder Specializes in Concrete Product

One specialty of an eastern builder is concrete steps for porches. Many of the houses in his city have been equipped with porches containing floors and steps of wood. The wooden steps soon rot away, and the house-owners send for the builder to repair the woodwork. Concrete steps are practically indestructible. The wise owner in numerous instances has gone so far as to thank the contractor for the helpful suggestion. Many people do not stop to consider the advantages of concrete construction and it is necessary for the builder to remind them of such.

## Potash Potentialities in America Which If Utilized Would Make Us Independent of Germany

A few years ago a Portland cement company in California found that it was feasible to save a considerable amount of potash as a by-product in the making of cement. A Maryland cement company sent experts to California and their investigations were so satisfactory that this company spent $100,000 in putting up a by-product potash plant. This has now been in operation for several years and has been so successful in making potash that a large number of other cement companies are preparing to establish by-product potash plants in connection with cement making. It has also been proven that potash can be recovered as a by-product in the manufacture of pig iron.

If every Portland cement plant and every pig iron furnace in the country could establish, in connection with their present plants, potash recovery systems, we would be able to make ourselves entirely independent forever of Germany's potash. In doing this we would give new impetus to all the agricultural interests of the country and fundamentally stimulate the production of foodstuffs.

In thus becoming absolutely independent of Germany's potash we would take from that country the power which it thinks it now holds to trade and barter in the final peace terms, with its potash as a dominant power.

We would be able to make ourselves wholly independent of German potash and forever establish an industry which would increase in proportion as we increased our output of cement and iron. The establishment of this industry on so large a scale would at the same time stimulate the utilization of the waste materials in other industries for potash production.

But there are difficulties in the way. A few days ago Secretary Lane, in a letter to Congressman Kitchin, pointed out that one cement plant which had expected to spend $100,000 on the establishment of a potash by-product system had been unable to do so because the proposed Income Tax bill would make the margin of safety too narrow to justify the investment of new capital. Mr. Lane very strongly urged that in the creation of new industries of this kind they should be free from heavy taxation on profits until their net profits enabled them to amortize their capital thus invested. The suggestion is certainly a wise one.

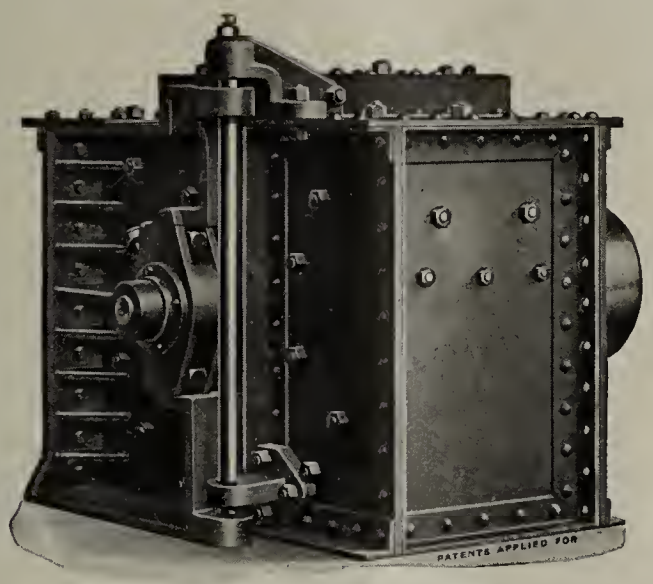
It can hardly be expected that new capital will go into enterprises of this kind, taking the chances of the uncertainties of after-war conditions, unless there is some assurance that the capital thus invested can be amortized before heavy taxation is laid upon its earnings, or unless assurance can be given that industries such, for instance, as that of potash will after the war be protected against the inroads which Germany would seek to make by breaking down the market for American potash.

It is possible to bring about the development of a potash industry which would make us entirely independent of German potash, and thus take from Germany the club which it now holds over the agricultural world in the possession of vast potash resources.

# Labor Saving High Speed Pulverizers

It is a well known fact that high speed pulverizers wear rapidly even on comparatively soft materials, owing to the sand blast action caused by the rapid rotation of crushing members. Nevertheless, such machines are unsurpassed in certain fields, for their enormous outputs more than compensate for rapid wear, so that the actual cost per ton of output is extremely low.

It is essential with the Hammer type of pulverizer to make frequent adjustments and renewals, to allow for the wear of the working parts, otherwise capacities will rapidly fall off and the cost of production be increased accordingly. A steadily decreasing output is more expensive than the actual shut-down, because the cost of production increases rapidly with worn




**Sturtevant High Speed Pulverizer.**

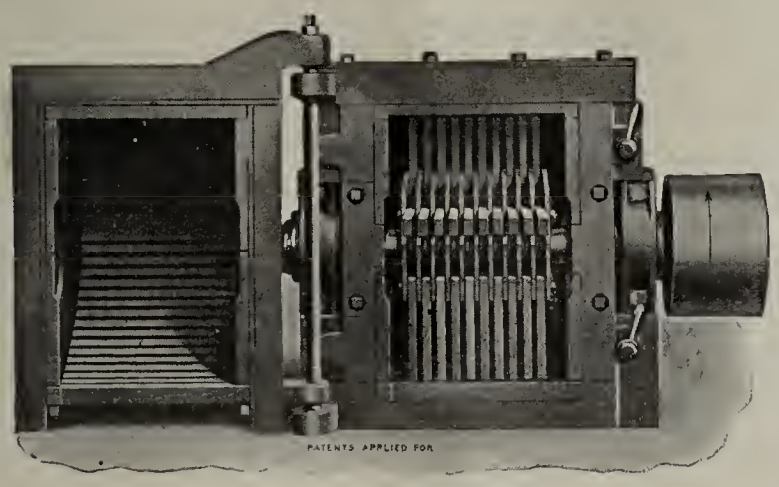
parts, and after a short period of inefficiency a shut-down is as inevitable as death and taxes.

Reduce delays—intermittent means inefficient—cut down the idle moments, reduce the waits, stop lost motion; speed up and keep going at high speed; it is necessary now.

In these days of high labor costs and maximum tonnage no one can afford loss of output from any cause; therefore, the machine about to be described deserves most careful consideration.

The manufacturer writes regarding same as follows:

The Swing Sledge Mill is practically a continuous producer because one man in one minute, without the use of tools of any kind, can open the door and get at every part of the machine for inspection, adjust-




**Swing Sledge Mill.**

ment or repair. There is no excuse for diminishing outputs, or waiting until the machine loses its efficiency before adjustments or repairs are made. Open the door every morning and see that every part is in the best condition for maximum output; it takes only a minute and assures the owner of maximum results.

If a machine is inaccessible it will be operated until, in self defense, repairs and adjustments must be made, but with the open door there is no excuse for neglect.

This mill needs no description—the open door not only exposes everything, but every part may be removed or adjusted through this opening. Nothing could be more simple. It has self aligning ball bearings, dumping grate, in fact, every advantage of the most improved pulverizers of this class, plus the open door feature, which is so important that it overshadows all other points of vantage.

This machine is built and sold by the Sturtevant Mill Co., Harrison Square, Boston, Mass.

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# Cement Company Has War Garden

Assistant Superintendent J. B. Lewis of the Universal Portland Cement plant at Buffington, Ind., is not only a capable excutive, but is some farmer, if the results of the war garden under his care on the plant's property are to be regarded as a criterion. Mr. Lewis has about six acres planted to a variety of vegetables right under the towering stacks of the big plant —in the front yard so to speak.

The most remarkable thing about it all is that barring a few loads of fertilizer, the soil is just as it was before the garden was planted and it is surprising to note the bountiful crop which the six supposedly almost sterile acres are yielding. Three acres planted to sweet corn and the men at the plant have been enjoying the delicacy since the season opened, for they are the favored individuals for whose benefit the garden was planted.

In addition there has been grown on these acres from ten to fifteen bushels of beans, about 20 bushels of beets and from 50 to 75 bushels of potatoes, besides other vegetables.

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# New Uses for Silo Forms

Ten years ago there were but few contractors in this country who were equipped with steel forms for building circular structures. Here and there a contractor rigged up a special form for round concrete grain bins, which were growing in favor for the large terminal grain elevators, built chiefly by the railroad and grain companies. About the same time the silo came into popularity in the middle west, and was seized upon as a profitable field for concrete construction.

The contractors who had steel forms adopted them readily to silo construction and straightway numerous equipment manufacturers set to work to develop molds. In a few short years many acceptable silo machines were on the market, and there are over a thousand of them now in use in the central part of this country.

There is no need as yet for contemplating the point of saturation in silo building, as the farmers have only begun to build. The silo building business will be flourishing for several generations, and in fact may never be done, as the intensity of farming must increase with the population. Many contractors, however, are taking advantage of the adaptability of silo forms to other classes of work. Among the other uses for silo equipment are the building of water tanks, stand pipes, grain bins, grain elevators, ash containers for industrial plants, elevated pockets for ore, gravel, stone, sand and coal, oil tanks, coaling stations for locomotives, coal tipples for mines, etc.

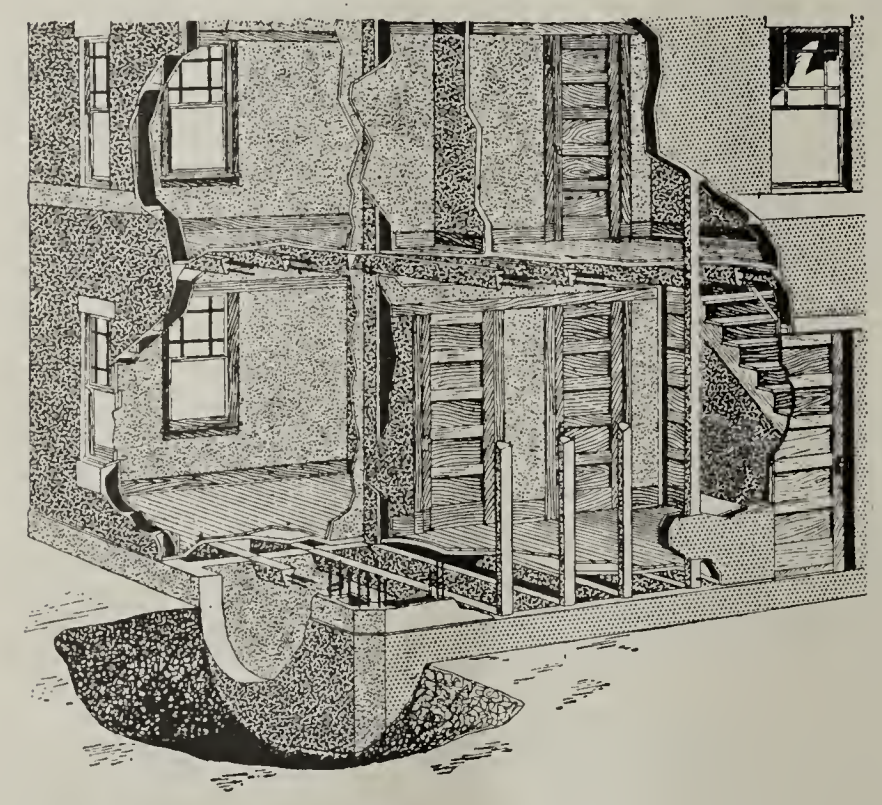
These are not merely suggestions, as already there are several examples of these diversified uses for silo building equipment.

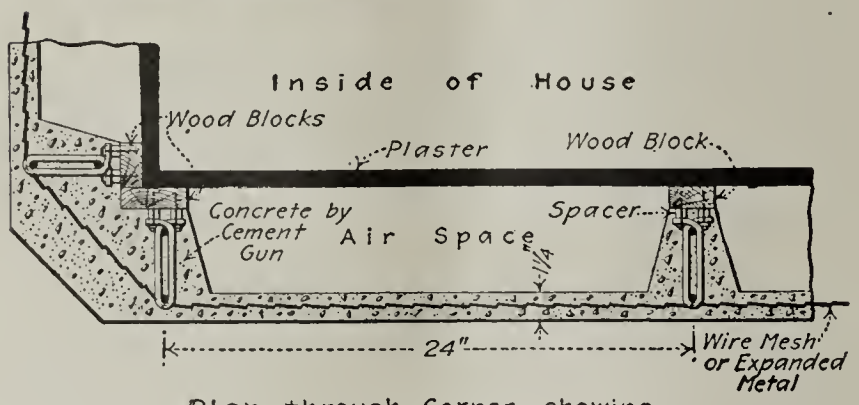
# Two New Designs of Houses of Concrete Throughout

### One Has Units Poured in Wire Cloth Forms with Air Space in Walls, Other Uses Cement Gun and Precast Beams

Shortage of houses throughout the industrial and shipbuilding centers of the country has led to a number of suggested designs which will provide safe and comfortable homes at reasonable cost and which at the same time lend themselves to quantity construction. Among these are two of somewhat similar details, which are of concrete throughout. They have reinforced-concrete frames with double walls of stucco and plaster, all erected with a minimum use of forms or stages.

Two experimental houses now being built for the Pennsylvania Cement Co. at its mill at Bath, Penn., embody as a new idea in dwelling construction the






Plan through Corner showing Typical Detail

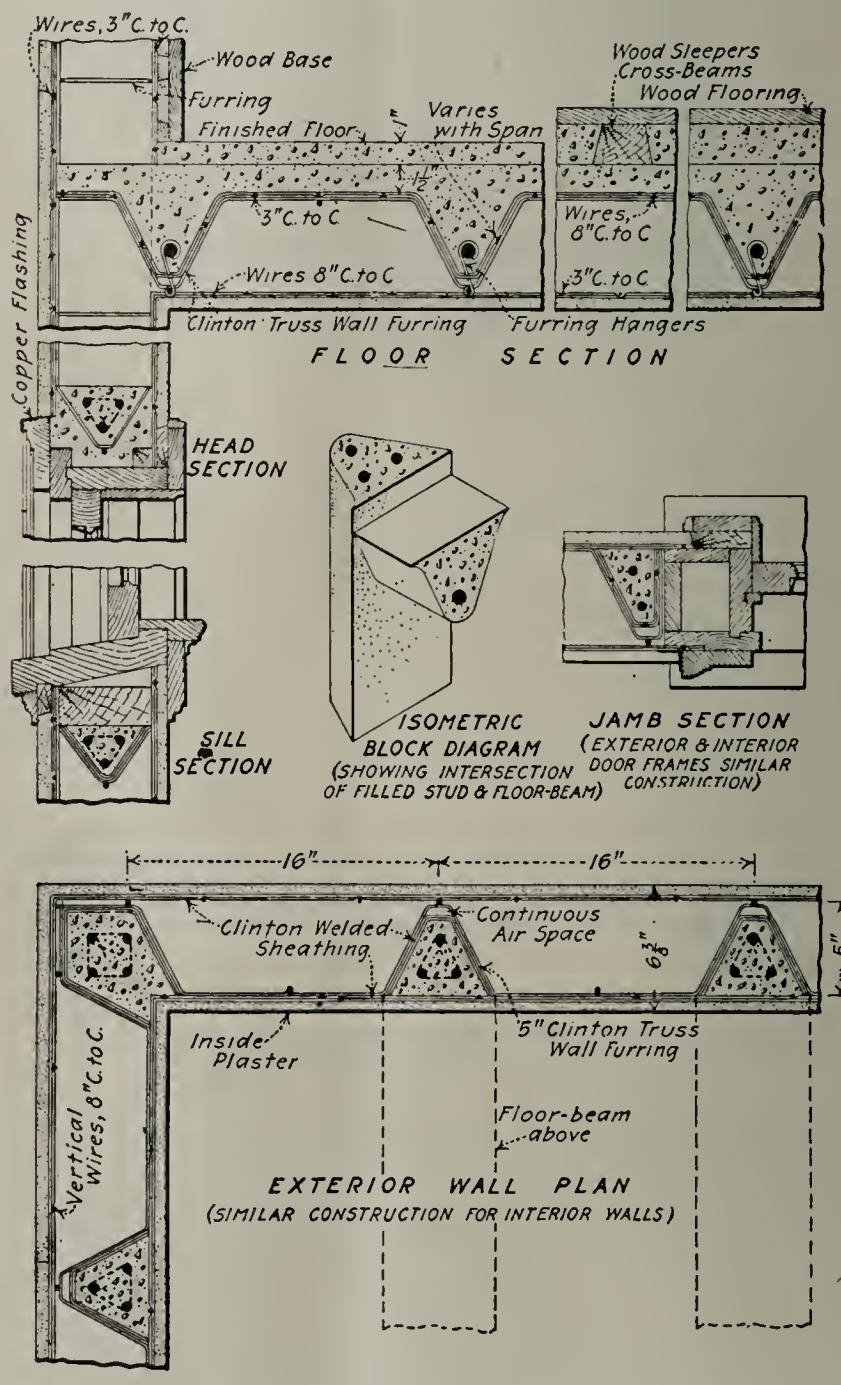
IN THIS TYPE THE CEMENT GUN IS USED

utilization of sheathed wire cloth as the forms in which to pour the concrete units making up the house frame. The type of construction has been named the "Alcho System" and is being developed by Albert Oliver, of the Clinton Wire Cloth Co., New York.

Fundamental in the design of the house are the studs, which are triangular in shape and of concrete reinforced as a column. On the inside of these studs is a plaster wall and on the outside a concrete stucco facing, leaving between an insulating air space. Each stud carries a floor-beam of similar triangular design, and integral with these floor-beams is a reinforced-concrete floor or roof.

The studs are erected on cellar or basement concrete walls poured in place, using as stud forms continuous sheets of Clinton welded sheathing, which is a building paper woven into a wire cloth. This is bent to shape the studs, and the concrete is poured inside. Outside the sheathing are rows of furring rods which protrude beyond the apex of the stud triangle and to which are fastened the sheathing, making the inside form for the outer wall. This leaves a small air space at each stud to prevent percolation through the wall there. The base of the stud also has sheathing against which the inner wall is plastered.

Beams are varied in depth according to the span required. They, too, are cast inside sheathing for forms, the sheathing being supported on struts during construction. Hangers left in the beams carry furring on which the ceiling is plastered. The floor itself is poured to be integral with the beams, and can be finished as desired. Wood frame doors and windows are detailed as shown in the drawings. Stairs are of concrete, and partitions of concrete or plaster applied on wire cloth. The roofing will be fire-resistent material on the concrete slab where flat and probably on timber-framing where sloping.




CONCRETE STUDS AND BEAMS POURED INSIDE SHEATHED WIRE CLOTH FORM FRAME

It is intended that the Bath houses shall be of poured concrete, with hand plastered walls and partitions. Provision is made, however, for the use of the cement gun in placing concrete, in which case the studs are turned with the base of the triangle outward to facilitate placing.

In a type of house devised by John V. Schaeffer,

president of the Cement Gun Construction Co., Chicago, it is intended that the studs and walls shall be built entirely by the cement gun, while the beams are precast concrete and the floors are poured in the usual manner.

In the accompanying sketch is shown a broken corner of a proposed house of the cement-gun type with all elements of construction in view, and a horizontal section through the wall showing the details of the characteristic design. This wall structure comprises studs on 34-in. centers integral with a 1¼-in. outer wall and separated from the inside plaster wall by wood blocks fastened to the studs and the wall, leaving an interior air cell for insulation against temperature and moisture.

In building the house a cellar is first excavated and cellar walls are built in the usual manner, except that recesses are left in which are set the precast joists for the first floor, spaced 24 in. on centers to match the studs. On this frame as a platform subsequent construction is carried on. A temporary timber framework is then erected on the platform and the wood blocks of the studs, to which has already been attached the reinforcement as shown in the floor section herewith, are set up.

After the wall reinforcing fabric is placed the walls and studs are shot with concrete from cement guns. When the upper floor is reached, precast beams are placed with protruding reinforcement intertwined with the reinforcement of the studs and the connection is made with the cement gun. Plastering, on wire mesh, is then placed on the inside wall and belt courses are shot around the tops of the studs so that all air spaces are isolated at each floor, and after the plastering is in place each air space or cell is a unit. This is designed to prevent circulation of air or migration of vermin.

Various methods are proposed for the backing against which the cement-gun concrete is forced, including the use of separate unit forms which can be used over and over, and sheathed wire fabric. In the latter case the fabric, being inside the wall, can be left in place.

In so far as the house itself is concerned, details of layout and architectural treatment can be provided to suit conditions in either of these designs. It is stated that estimates of cost submitted by reliable contractors are higher than for plain-work construction, but compare favorably with the cost of the cheaper type of brick house with wood floors. The method is cheaper than most fire-resisting construction.

# Domestic Materials Supplant Imported Flint Pebbles and Flint Linings

Before 1914 practically all the flint pebbles used in grinding processes by metallurgic and cement mills in this country were imported. This was one of the supplies for which the United States was dependent on Europe. Now the United States Geological Survey, Department of the Interior, announces with satisfaction that approximately 12,000 tons of grinding pebbles for tube mills and 3,050 tons of silica tube-mill liners were produced and sold in this country in 1917. Besides these quantities of grinding pebbles and liners reported to the Geological Survey, considerable unreported quantities of pebbles and blocks of rock and ore were collected and used by metallurgic and cement mills.

The Bureau of Foreign and Domestic Commerce, Department of Commerce, reports that the "flint, flints and flintstones, unground" imported for consumption in 1917 were valued at $197,156. This value represents about 15,000 tons, part of which, possibly 10 per cent, was "boulder flints" ground for use in ceramic wares. It thus appears that about 30,000 tons of tube-mill lining and grinding pebbles were used in this country in 1917 and that more than 50 per cent of the demand was supplied by domestic materials. The domestic substitutes for imported flints have given satisfaction and have been no more expensive—some have been less expensive—than the French, Danish and Belgian materials, facts attested by reports of the consumers in letters to the producers and to the Geological Survey and even more emphatically by "repeat orders."

### Sources of Grinding Pebbles

The grinding pebbles or substitutes therefor produced in the United States during the last few years have been derived principally from the three sources indicated below.

1. Grinding pebbles were gathered from the beaches between Oceanside and Encinitas, San Diego county, Cal., by the individuals and firms whose names and addresses are listed below. Smooth, round or nearly round pebbles, ranging in diameter from 2 to 7 inches, are picked out by hand on the beaches and assorted according to size. Samples submitted to the Geological Survey are chiefly pebbles of fine-grained tuffs, granite porphyries, quartz porphyries, felsites, and granites. These are all tough rocks, and the pebbles are said to be harder to break than Danish flint pebbles, but as they are coarser grained than flints they are not so smooth and wear somewhat faster on hard ores. Cement grinders are said to have found these pebbles as efficient as the imported flints. The waste of California pebbles per ton of finished cement is about 1½ pounds. With extremely hard ores the California pebbles are reported to be less efficient than the Danish flints, the waste of the pebbles per ton of ore ground being more than that with Danish flints, which have also the advantage of giving a smaller load, as they are not so heavy. However, the California pebbles do the grinding as well as the Danish pebbles and cost less—in some places less than half as much.

2. Artificially rounded blocks of rock made at Manhattan, Nev., have been supplied to metallurgic mills near that town at prices very much lower than those of imported flints, and have proved satisfactory for grinding the ores of that region. These pebbles are made from a chalcedonized rhyolite, which is quarried and broken into polygonal blocks that are rounded by tumbling in a barrel-like mill. The tumbling also eliminates the cracked or weak blocks.

3. Near Jasper, Minn., a fine-grained, very hard quartzite is quarried and worked up into cubical or roughly rounded blocks for use as grinding pebbles and also into dimension blocks and tube-mill linings. This quartzite is a siliceous rock containing, besides quartz, only very small amounts of silicates and a little oxide of iron, which stains the rock pink. The blocks compare

favorably in hardness, toughness, and specific gravity with imported flints and appear to form an equally efficient grinding agent. The use of a full load of cubical or square-edged or even of only partly rounded blocks in a tube mill undoubtedly reduces the grinding capacity of the mill, but the square edges and sharp corners of such blocks soon break off and round up, and their subsequent reduction is very slow. No doubt cubical blocks can be used efficiently if they are fed to a loaded mill in small portions at a time, so that the capacity of the mill will at no time be reduced by a heavy load of rough blocks. Such procedure is in accordance with what appears to be the best tube-mill practice—that is, of feeding a small quantity of fresh pebbles daily in order to keep the load in the mill up to the predetermined standard for highest efficiency.

The California beach pebbles and similar pebbles that contain iron in the form of oxide or silicate mineral can probably not be used without detriment to the mill product when silica, feldspar, and other ceramic ingredients are ground, for the content of iron in the higher grades of such wares must be kept very small or eliminated, but pebbles containing small quantities of iron-bearing minerals are in no way objectionable for metallurgic work and for grinding cement ingredients and clinker. The quartzite from a quarry at Jasper, Minn., contains so little iron that it can be used in grinding silica and felspar. Several grinders of silica in Ohio and Illinois have used with satisfaction these pebbles and the silica linings from the same quarry.

Besides the localities above noted there are prospective sources of grinding pebbles in Pike, Sevier, and Howard counties, Ark., which are described in Geological Survey Bulletin 690-B, "Gravel deposits of the Caddo Gap and De Queen quadrangles, Ark.," by H. D. Miser and A. H. Purdue; on the shores of Lake Superior; on the shores of Essex County, Mass.; and in York and Washington counties, Maine. Pebbles have been supplied to cement and other mills from the beaches of Lake Superior, but they seem to have been unsatisfactory, probably because they were not carefully selected. No pebbles have been marketed from Arkansas, but the geologists who have examined the deposits there report the occurrence of large quantities of pebbles of novaculite, a very pure silica, which are of suitable size anl shapes for use in grinding. No pebbles have been marketed from the beaches in New England, but Government geologists who have seen the beaches are confident that large quantities of granite, felsite, and rhyolite pebbles of suitable size and shape and of undoubted hardness and toughness for use in grinding can be obtained there.

### Tube-Mill Liners

Tube-mill liners have been obtained chiefly from three localities in the United States. Two of these supply flint or chert from beds intercalated in limestone formations, and the third supplies quartzite. One is near Iron City, Tenn., where the "Fort Payne chert" is utilized. The second is in Florida, in the region of the outcrop of the Ocala limestone, from Suwanee County to Hillsboro County. The third locality is at Jasper, Minn., where the quartzite described above is quarried. The flint or chert and quartzite from these localities are worked up into dimension blocks by the firms listed below. The occurrence of material suitable for making flint or silica linings has been reported at two other localities, but no definite information concerning them is yet available. The beds of chert or flint in many of the limestone formations of the Appalachian and Mississippi Valley regions could probably also furnish a material suitable for silica lining, but nothing definite can yet be said concerning the availability of the rock in those beds.

The reports available to the Geological Survey show that the silica linings made from rocks at the three localities mentioned have been wholly satisfactory. The material used is practically pure silica, tough, hard, and resistant to wear, and the linings furnished have been carefully shaped to dimensions. All manufacturers report increasing business with repeat orders from their customers.

The following is a list of names and addresses of firms and individuals that sold tube-mill pebbles and liners in 1917:

### Producers of Grinding Pebbles

Beach pebbles—

Robert Burns & Co., Oceanside, San Diego County, Cal.

Frederick E. Browne, 619 I. W. Hellman Building, Los Angeles, Cal.

Encinitas Pebble Co., P. O. Box 499, San Diego, Cal.

John T. Momand, Encinitas, Cal.

Thebo & Tingman, Encinitas, Cal.

Artificially rounded rhyolite—

Omer Maris, Manhatton, Nev.

Cubical or partly rounded 3 to 5 inch quartzite blocks—

Jasper Stone Co., 204 Lytle Building, Sioux City, Iowa.

### Producers of Silica Linings

S. W. Chiles, 123 Garrison Street, Bethlehem, Pa.

E. L. Lull, Prop., American Flint Co., Iron City, Tenn.

Jasper Stone Co., 204 Lytle Building, Sioux City, Iowa.

## Building the Biggest Shipyard on the Pacific Coast

The magnitude of the twenty-million dollar shipyard which the Aberthaw Construction Company, of Boston, Mass., is erecting for the Bethlehem Shipbuilding Corporation at Alameda, Calif., on a tract a mile long by nearly half a mile wide, is revealed by the following figures.

The aggregate floor area of the twenty-three principal buildings will be thirty and one-half acres. Among these will be the plate and angle shop of five and five-eighths acres ground area, a five-story warehouse with about half this acreage in floor area, and a five-story office building with a total of well over an acre of floor space. Many of the other buildings, among which are the iron and brass foundries, the mold loft, the sheet metal, pipe and joiner shops and power house, range from 30,000 to 100,000 square feet in floor area.

The construction of all the buildings and the ten building slips calls for about 3,000,000 feet of hard pine, over a million and one-half square feet of sash, about 700,000 square feet of gypsum roofing, 8,000 tons of structural steel, and 100,000 barrels of cement. Over 70,000 wood piles will be driven and from three to four million cubic yards of dredging will be required. The Aberthaw Company will employ more than 15,000 men on this construction.

## Jeffrey's Cleveland Branch Office

The Jeffrey Manufacturing Company of Columbus, Ohio, announce the re-opening of their Cleveland Branch Office, at 437 Leader-News Bldg., which will be in charge of Messrs. P. C. Dierdorff and C. B. Reed.

Both of these gentlemen have had many years of successful sales and engineering experience in the manufacture and application of the Jeffrey Products, and are especially qualified to take care of the constantly increasing demand for Jeffrey machinery in their territory, as well as render valuable advisory service to customers in solving their elevating, conveying, crushing and mining machinery problems.

# Motor Trucks Cheaper Than Teams on Hauling Gravel

## Distributed Costs Show a Saving of About 20 Cents Per Yard-Mile—Machines Particularly Good on Harder Work

By F. P. Scott, Flathead County Engineering Department, Kalispell, Mont.

Accurately distributed costs of construction work unfortunately are found only occasionally in engineering journals. In great measure this is due to an unwillingness on the part of contractors to make public information which they consider to be of a private nature, though the lack of curiosity on the part of public officials, or perhaps the absence of proper facilities on the part of these men may be responsible for much of the silence complained of above. So much of benefit to the general public would issue from a freer publication of data of this nature, than the following tabular comparison of the costs of hauling gravel for road building by motor truck and teams is given as an indication both of the writer's attitude toward the importance of the matter and of the economies which may be attained through the purchase and proper use of modern equipment.

GRAVEL BY TEAMS AND BY MOTOR TRUCKS AT THIRTEEN MONTANA PITS

| Spreading | | | Hauling (Truck) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Labor Men | Teams | Int. and Depr. | Operator | Repairs | Fuel | Ave. Haul | Cu.Yd. Hauled | Int. Depr. | Cost Yd. Mi. | Miles of Gravel | Superintendence | General Exp. | Total Cost | Unit Cost per Yd. | Cu.Yd. per Mile | Unit Cost per Mile |
| 276.00 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1.20 | 24.80 | 19.00 | 1,643.92 | 1.342 | 1,021 | 1,369.93 |
| 103.50 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | | | | | | | |
| 272.00 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 0.75 | 12.45 | 29.15 | 1,172.25 | 1.411 | 1,108 | 1,563.00 |
| 102.00 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | | | | | | | |
| 115.00 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 0.41 | 7.00 | 8.00 | 665.74 | 1.235 | 1,315 | 1,624.00 |
| 43.50 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | | | | | | | |
| 196.00 | 73.00 | ..... | 242.00 | 5.00 | ..... | ..... | ..... | ..... | ..... | | | | | | | |
| 412.14 | 21.76 | 4.50 | 93.12 | 30.40 | 113.51 | 2.114 | 865 | 297.18 | 0.292 | 5.07 | 55.00 | 40.00 | 5,257.45 | 1.158 | 900 | 1,037.00 |
| 330.00 | 40.00 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | | | | | | | |
| 123.75 | 14.00 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 0.90 | 28.00 | 15.00 | 3,346.73 | 2.584 | 1,353 | 3,719.00 |
| 830.00 | 95.00 | ..... | 100.00 | 20.00 | ..... | ..... | ..... | ..... | ..... | | | | | | | |
| 311.20 | 35.63 | 5.00 | 38.50 | 10.85 | 54.86 | 2.41 | 385 | 152.82 | 0.277 | 3.31 | 57.00 | 25.00 | 3,866.76 | 1.256 | 930 | 1,168.00 |
| 116.00 | 18.50 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | | | | | | | |
| 43.50 | 6.94 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 0.50 | 7.00 | 6.50 | 775.31 | 1.402 | 1,106 | 1,551.00 |
| 780.00 | 108.00 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | | | | | | | |
| 291.76 | 40.50 | 5.50 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2.55 | 58.00 | 53.00 | 4,871.96 | 1.082 | 1,766 | 1,910.57 |
| 230.00 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | | | | | | | |
| 86.21 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 0.89 | 19.00 | 16.00 | 1,489.48 | 1.281 | 1,307 | 1,674.00 |
| 83.00 | 64.00 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | | | | | | | |
| 31.08 | 24.00 | 4.75 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2.50 | 60.00 | 35.00 | 3,248.78 | 1.022 | 1,271 | 1,300.00 |
| 118.00 | ..... | ..... | 117.00 | 16.00 | ..... | ..... | ..... | ..... | ..... | | | | | | | |
| 41.69 | ..... | ..... | 55.93 | 24.62 | 52.31 | 2.416 | 500 | 58.50 | 0.158 | 0.45 | 6.20 | 5.00 | 997.49 | 1.995 | 1,111 | 1,995.00 |
| 523 00 | 30.00 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | | | | | | | |
| 196.13 | 11.19 | 3.50 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1.76 | 51.00 | 30.00 | 2,332.56 | 1.4515 | 913 | 1,325.32 |
| 355.00 | ..... | ..... | 247.00 | 25.00 | ..... | ..... | ..... | ..... | ..... | | | | | | | |
| 151.45 | ..... | ..... | 104.50 | 65.72 | 99.95 | 1.805 | 1,187 | 186.66 | 0.213 | 1.25 | 25.00 | 22.50 | 2,753.72 | 1.409 | 1,563 | 2,203.00 |
| 1,937.91 | 154.02 | 23.25 | 292.05 | 131.59 | 320.63 | 2.079 | 2,937 | 695.16 | 0.235 | 21.54 | 410.45 | 304.15 | 32,422.15 | 1.303 | 1,156 | 1,505.00 |

At the time of the purchase of the truck, which was of 5 tons rating and of 5 cubic yards capacity, the intention was to use it on the greater part of the hauling. Unfortunately—at least from one angle—delivery was considerably delayed and much of the spring hauling had to be done by team. This afforded excellent opportunity for a comparison of the costs of the two methods. The data were gathered from the various jobs through the use of a standard report card kept by the foremen or timekeepers and turned in at the end of each day.

While there might be a question as to the fairness of the comparison, in that the teams did most of their work during the spring, the past season was an unusual one for this region. Roads in this section of the country in most cases dry very soon after a rain, and when last year's spring rains were over the roads were in first-class condition for about two weeks. Shortly thereafter they began to get dusty and full of sand pockets, which made hauling exceptionally difficult throughout the remainder of the season. For this reason I believe that the comparison is fair and most generous to the teams.

Included in the table are only those items which are chargeable to getting the gravel to the roads, which had previously been graded and drained. Merely as a matter of incidental information it might be said that the roadway was metalled to a width of from 12 to 14 ft., the gravel being spread with a grader or by hand and then rolled. In general it was applied in one course to a depth of about 10 in., but in some cases, where the roadway ran through wet land, two 6 in. courses were laid down. The depth of the gravel as placed is sufficient for the present traffic. There has been no attempt to provide roads for the future, but only to give relief to the largest possible territory with the money available. At the present time there are approximately 30 miles of graveled roads in the county, all of which have given very good service.

At some of the pits the "pit run" was suitable material for road surfacing—the maximum size being 2½ in.—while at other pits approximately 25% had to be wasted, which accounts for the wide variations in the loading costs. At the Keller and the Gudgel pits there was very little material suitable for surfacing and it was run through the crusher.

The accompanying table shows that the truck proved far more economical than the teams. Gravel was hauled from the Cornelison and the Funk pits by both methods, the truck being given the longer haul and the poorest roads. At the Gudgel and the Straleu pits the haul was over previously graveled roads in part. The hauling costs for teams show exceptionally high from the Dodge pit and may be traced to some extent to a hill ¼ mile long, which required a helping team and man for every six teams hauling.

Labor and supplies were paid for at the following rates: Common labor, $0.375 per hour; team and teamster, $0.75 per hour; foreman, $0.45 per hour; truck drivers, $100 per month; gasoline, $0.27 per gallon; oil, $0.52 per gallon; coal, $8.60 per ton.

The cost sheet shows that there were 34851.6 yard-miles of gravel hauled by the teams, and that the truck saved $0.196 per yard-mile; or, if all had been hauled by the truck, a saving of $6830.90 would have been made—which is a strong argument in favor of the purchase of another truck. Under present conditions the

COMPARISON OF THE COSTS OF LOADING, SPREADING AND HAULING

| Pits | | Loading: Labor Men | Labor Teams | Engineman | Fuel | Supplies | Repairs | Prep. Exp. | Int. Depr. | Cost per Cu.Yd. | Hauling (Teams): Labor Men | Labor Teams | Depr. | Int. | Ave. Haul Miles | Cu.Yd. Hauled | Cost per Yd.Mi. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Adams .... | Hrs. | 904.00 | 312.00 | ..... | ..... | ..... | 116.00 | ..... | ..... | ..... | 1,292.5 | 1,212.5 | ..... | ..... | ..... | ..... | ..... |
| | Amt | 345.00 | 117.00 | ..... | ..... | ..... | 43.55 | ..... | 39.16 | 0.445 | 490.69 | 454.69 | 5.00 | 1.53 | 1.53 | 1,225.00 | 0.508 |
| Anderson... | Hrs. | 860.00 | 200.00 | ..... | ..... | ..... | ..... | 12.00 | ..... | ..... | 808.00 | 748.00 | ..... | ..... | ..... | ..... | ..... |
| | Amt | 330.00 | 75.00 | ..... | ..... | ..... | ..... | 4.80 | 25.25 | 0.524 | 308.00 | 280.50 | 3.75 | 1.35 | 1.735 | 831.0 | 0.412 |
| Buck..... | Hrs | 280.00 | 150.00 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 544.00 | 519.00 | ..... | ..... | ..... | ..... | ..... |
| | Amt. | 107.60 | 56.25 | ..... | ..... | ..... | ..... | ..... | 31.94 | 0.363 | 205.89 | 194.64 | 9.75 | 1.17 | 1.815 | 539.00 | 0.421 |
| Cornelison.. | Hrs. | 2,570.00 | 1,520.00 | ..... | ..... | ..... | 100.00 | 545.00 | ..... | ..... | 2,880.00 | 2,810.00 | ..... | ..... | ..... | ..... | ..... |
| | Amt. | 956.12 | 556.88 | ..... | ..... | 30.00 | 37.50 | 323.68 | 77.16 | 0.436 | 1,084.14 | 1,053.76 | 62.50 | 8.10 | 1.536 | 3,676.00 | 0.391 |
| Dodge..... | Hrs. | 1,665.00 | 500.00 | ..... | ..... | ..... | 70.00 | 400.00 | ..... | ..... | 2,685.00 | 2,890.00 | ..... | ..... | ..... | ..... | ..... |
| | Amt. | 670.80 | 187.50 | ..... | ..... | ..... | 26.25 | 150.00 | 27.00 | 0.872 | 994.50 | 1,083.75 | 23.50 | 2.70 | 2.125 | 1,218.00 | 0 813 |
| Funk..... | Hrs. | 1,916.00 | 1,010.00 | ..... | ..... | ..... | 230.00 | ..... | ..... | ..... | 2,391.00 | 2,370.00 | ..... | ..... | ..... | ..... | ..... |
| | Amt. | 762.63 | 378.76 | ..... | ..... | ..... | 86.25 | ..... | 62.00 | 0.419 | 899.48 | 888.78 | 45.00 | 3.00 | 1.73 | 26.92 | 0.394 |
| Good..... | Hrs. | 508.00 | 218.00 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 504.00 | 592.00 | ..... | ..... | ..... | ..... | ..... |
| | Amt. | 193.40 | 81.75 | ..... | ..... | ..... | ..... | ..... | 19.57 | 0.533 | 192.15 | 222.00 | 2.50 | ..... | 1.162 | 553.00 | 0.648 |
| Keller..... | Hrs. | 3,498.00 | 1,495.00 | ..... | ..... | ..... | ..... | 184.00 | ..... | ..... | 2,422.00 | 2,092.00 | ..... | ..... | ..... | ..... | ..... |
| | Amt. | 1,328.61 | 561.97 | 390.00 | 146.61 | 10.00 | 20.00 | 87.08 | 151.21 | 0.598 | 930.16 | 784.42 | 9.90 | 3.24 | 1.055 | 4,503.5 | 0.364 |
| Reddick.... | Hrs. | 505.00 | 220.00 | ..... | ..... | ..... | ..... | 130.00 | ..... | ..... | 1,289.00 | 1,219.00 | ..... | ..... | ..... | ..... | ..... |
| | Amt. | 186.00 | 82.50 | ..... | ..... | ..... | ..... | 92.25 | 46.61 | 0.350 | 481.91 | 457.16 | 19.50 | 2.34 | 1.760 | 1,163.00 | 0.469 |
| Sheldon..... | Hrs. | 1,582.00 | 776.00 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2,879.00 | 2,787.00 | ..... | ..... | ..... | ..... | ..... |
| | Amt. | 599.99 | 290.95 | ..... | ..... | ..... | ..... | ..... | 56.62 | 0.298 | 1,086.19 | 1,045.08 | 13.50 | 1.62 | 1.934 | 3,178.00 | 0.349 |
| Straleu..... | Hrs. | 603.00 | 171.00 | 90.00 | ..... | ..... | 18.00 | 444.00 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | Amt | 250.76 | 76.00 | 45.00 | 32.01 | ..... | 15.19 | 288.78 | 45.50 | 1.506 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Winston.... | Hrs. | 872.50 | 256.50 | ..... | ..... | ..... | ..... | 203.00 | ..... | ..... | 1,995.00 | 1,870.00 | ..... | ..... | ..... | ..... | ..... |
| | Amt. | 356.45 | 97.57 | ..... | ..... | 30.75 | ..... | 77.63 | 6.89 | 0.354 | 757.55 | 701.30 | 11.25 | 1.35 | 2.202 | 1,607.00 | 0.416 |
| Gudgel..... | Hrs. | 2,133.00 | 785.00 | 238.00 | 20.17 ton | ... | 44.00 | 697.00 | ..... | ..... | 239.50 | 191.50 | ..... | ..... | ..... | ..... | ..... |
| | Amt. | 815.52 | 305.27 | 125.00 | 197.58 | 21.70 | 18.70 | 272.89 | 141.37 | 0.971 | 115.58 | 79.33 | 4.00 | 1.00 | 0.704 | 767.00 | 0.370 |
| | | 6,902.88 | 2,867.40 | 560.00 | 376.20 | 92.45 | 247.44 | 1,297.11 | 730.28 | 0.526 | 7,546.24 | 7,245.41 | 210.15 | 27.40 | 1,588 | 21,952.50 | 0.431 |

use of the truck by itself has made the loading cost higher than it should be, as it does not work the loading equipment to full capacity. It is believed that the hauling cost for another season can be cut to $0.20 per yard-mile.

The engineering force is composed of A. L. Saunders, county engineer; Milton Hoidal and F. P. Scott, deputies.

## Reinforce Concrete Barge

During the past winter the J. W. Thompson Sand & Gravel Co., of New Orleans, built the concrete barge shown above to transport sand and gravel used in its contracting business. The barge was successfully completed and launched the last week in March and so satisfactory has it been in every way that another was immediately commenced.

Concrete as a ship-building material attracts a great deal of attention, and the U. S. Shipping Board has asked for $50,000,000 to be used in building concrete ships.

## Contracts Let for 25 Concrete Barges

The Caldwell-Marshall Company, who are at present engaged in constructing a plant at Tonawanda, N. Y., for the purpose of building concrete barges for the government, will turn out four of the boats. Contracts have been let for 21 barges to various concerns in the state. Besides those that the Tonawanda Company will build, eight will be constructed by the Holler-Davis and Flood Company at Fort Edward, N. Y., five by Thomas & Currie at Detroit, Mich., and four by the Cummings Concrete Constructural Enginering Company of Ithaca.

The barges when finished will have a displacement of 500 tons and the average price for building is $25,000. In the contract let for the canal boats by the inland waterways committee of the railroad administration, it is specified that they must be delivered before the close of canal navigation this year. This will be about December 1.

**Reinforced Concrete Barge, Mila No. 1, Built 1918, by the J. W. Thompson Sand & Gravel Co., New Orleans.**

## The First American Concrete Ship

The reinforced concrete cargo steamship "Faith" which left a California port some weeks ago for a west coast South American port was, a few days ago, reported as having arrived safely and in first-class condition. The "Faith" is discharging her cargo of lumber and is expected to reload for an American port, which she will reach via the Panama Canal.

## Road Building

Road building is one of the most purely patriotic occupations Americans can engage in. France held Verdun by means of her good roads. The railroads to that fortress was shot away. Its place was taken by 14,000 motor trucks, which kept the front supplied with men and munitions. If we fail to build roads the day may come when we shall repent of our remissness. "Too late, too late," will be the cry.

# The Standing and Compensation of the Building Contractor

The contracting profession, according to a paper presented at a recent meeting of the Wisconsin Master Builders' Association, has three major afflictions: (1) It has no standing; (2) the compensation is too small; (3) its members are poor business men. The author of this paper, Mr. W. A. Klinger, a contractor, of Milwaukee, Wis., suggested the following remedies for the afflictions:

### Improving Status of Contracting Profession

Taking pride in our profession, let's turn out better products. The more we put the stamp of quality on our work, the better the reaction on the profession. The more we educate the public to quality, the harder the course of the shyster. Educate him to your own standards, or hound him out by making the continuation of his practice impossible. Exposure is a sure cure for foul practice. Architects who are employed as experts by owners should be convinced that it pays both them and the owner to select contractors of standing for their work.

To be a contractor will mean more when it is a little more difficult to become a contractor. At present anybody with nerve and the first installment of equipment can call himself a builder. Any one of our foremen who thinks he knows more than his boss—and they are all firm in that opinion—becomes a contractor. He operates for a while as a shyster, then either blooms out and justifies his start, or, in nine cases out of ten, kills a whole lot of business for us and then goes to the wall. But there is always somebody to take each vacant place.

There prevails an unjustifiable extension of credit on the part of the material man. The material man unhesitatingly sells to any contractor, knowing he can get protection by virtue of the existing lien law. He quotes to poor pay just as he does to the man who discounts. If he didn't have the iron-clad protection of the lien law and sold to contractors according to their credit ratings and their ability to pay, the shyster and the cut-price competitor would have to have a working capital before he could start as a contractor. Consequently, he wouldn't start. We can render great assistance, and improve our business standing vastly by unhesitatingly complying with requests for financial statements. Financial statements are used more and more in all lines of business.

Besides financial responsibility, the man who aspires to the building profession should be a real builder. An ability to nail a 2x4 does not constitute a builder. I believe a system of State licensing, much as our State law licensing architects, should be worked out. The architects expect the licensing of architects to do much to improve the personnel of their profession. A similar law for builders could not do otherwise than improve the personnel of our profession. The test of an applicant for a license as a builder should be responsibility and character, experience as a builder for others, training and general knowledge, reading of plans, etc. The designation "contractor" or "builder" would then mean something. It would mark a man as experienced and able, a real builder, and give tone to the profession, by an exclusion of the unreliable, the ignorant and the unworthy.

We can then cure illness No. 1 and improve the standing of the profession by three means:

1. By taking and showing pride in the profession.
2. By dwelling on quality and educating the public and the architect to it.
3. By an elimination of the undesirable in the profession by means of legislation, namely, a change in the lien law and a system of State licensing of builders.

### Better Compensation for the Contractor

The remedy for illness No. 2, that the compensation of the contractor is too small, is very plain. Simply charge more for your services. Being in a business in which you have every reason to take great pride, do not hold yourself too cheaply. When you figure work, do not forget the personal service you render. You have, by virtue of constant practice and much experience, become an expert in your line, and your compensation should be fixed accordingly. Remember, by virtue of your investment, the equipment you own and your working capital, you are entitled to a margin of profit. Over and above that, you are entitled to a salary commensurate with your experience and ability. If you have made yourself an expert, if you have devised systems of doing work more cheaply than others, you are entitled to profit by your ingenuity. Why work up an organization better and more efficient than the other fellow and then take work so much below his price that the owner alone benefits by your ability? Make your ability earn dividends for yourself. Make it earn for you a good annual salary, independent of the return on your investment.

### Business Ability of Contractor

The third illness which our diagnosis reveals, and by far its most serious affliction, is the fact that contractors are poor business men.

There are three essentials to good business. Produce a quality product and know what your product costs. Second, sell that product at a price with a fair margin of profit. Third, after the delivery of that product, collect the price agreed upon. Do we measure up to these requirements as good business men? I think we do not.

In the first place, most of us do not know what our products cost. We can find out our costs only through a good cost-keeping system. An occasional checking up of this or that man, at this or that particular piece of work for a short period, does not constitute a cost-keeping system. The costs must extend over a period of time, must be kept under both favorable and adverse circumstances, must represent the efforts of more than one man, and should represent costs on the same process repeatedly, so as to get a good average value. A cost-keeping system should be accurate or it is worthless. It should be simple and free from too involved analysis. We have known of systems that wound up at the conclusion of a job with a pile of reports a foot high, none complete in itself, all waiting for time for a month or two to dig through them, complete the calculations and summarize. And the results desired have been lost in a maze of unimportant data. Simplicity should rule. Interest should be paramount. The close of each payroll should mark a checking up of the work performed.

Having accurately ascertained the costs of the work, do not let your judgment sway the figures resulting. When estimating work, use the results of your cost system, tempered by circumstances peculiar to the work estimated upon. Make up a figure representing the total net cost of the work. To that should be added the insurance costs, bond costs, equipment, expenses and the overhead. We have all heard enough about overhead to know what it means, and to know what it consists of. But, curiously, we seem to forget its existence when we make up an estimate. Overhead exists, and if it does not exist by virtue of an item in your costs, it is the parasite on your profit. We all have overhead expense. Even the man who carries his business in his vest pocket has overhead. Determine its relation to your business and charge accordingly.

Having determined the gross cost, add a reasonable profit. That profit represents the only variable in your estimate. The gross cost when scientifically and accurately calculated should be in your judgment a fixed quality. The fact that you want a job badly does not affect the cost of that building. The fact that you need the work to keep an organization together does not affect the cost of the building. Those considerations should affect only the profit item of your estimate.

The wide variation in contractors' bids is traceable to the fact that we let a desire for a contract influence our estimate of the cost. I can not emphasize too much the point that it takes a certain amount of labor and material to do a certain piece of work, and, whether we want the job or not, that amount of labor and material is necessary, and is not influenced one iota by your need for the work. Let such a need influence your profit item only.

Having once made the estimate of the work, that estimate, if properly made and based on a good cost system, represents your best judgement of the value of the work, and should, of course, be your tender for the work. The real test of business ability comes between the time your tender is given to the architect and the awarding of the contract. I think it is safe to say that more money is lost by the contractor in the office of the architect than out on the work. I am sure you will agree with me if you will recall how often you have been met with the old, old story: "Jones, I'm sorry, but you're high. I'd like to give you this work, and so would the owner, but the job runs a little high, and we've got a better price. You had better take these plans and look over your bid. See what you can do." And when you take those plans, or when you ask, "How much lower is his figure?" that is the first day of your Waterloo. And in that battle of the second and third day you lose. You cut your price to meet that of a competitor, or you cut your price that was already low. In either event, you lose.

If you had a slate of the ethics of the profession of contracting, Rule No. 2 on that code would be: "Let your first tender for a piece of work be your final tender." We might occasionally lose a contract, but those we got would be at our price, and not at some competitor's price. And in the end we would all be getting the price that our best judgment fixed as the reasonable price on the work.

Having agreed upon a price, your battle is only half won. Contractors have for years been signing documents in which they signed away every equity they have, and placed their entire fate in the hands of a third party, paid by the owner. Contracts making the architect the interpreter of the meaning and intent of his own plans and specifications, and making him the sole judge of their execution, in his employer's behalf, are eminently unfair. The road to the use of an eminently fair contract has been made easy for us, if we but adopt and insist upon the use of the Standard Documents of the American Institute of Architects, as approved by the National Association of Builders' Exchanges. These documents have been prepared by joint committees of these bodies, with the assistance of the best legal talent. They have for their basic thought justice to both contracting parties and recourse to arbitration for all disputes. At present in their third edition, they are not perfect, but are far superior to anything we have had before, and represent the best and most recent thought on the subject.

Having signed this contract, execute it according to its tenets. Where written notice is required from the architect or owner, insist upon such notice. Where written notice is demanded from you, give such notice.

For the period of the war the building industry will probably not boom, in fact, it will probably travel very slowly. The fight for work will be keen, the temptation to grab it at any cost will be strong, but that temptation must be fought. It is far better to repair a machine while it is idle than to attempt it on the go. If not busy building a building, let's build a profession. Let us carefully administer those cures so that when the rush of business comes, as it surely will, our profession, through mutual effort, has lifted itself to a higher plane. Organized effort will effect the cure.

## NEWS ITEMS

Edwin Smith, an employe of the Ash Grove Lime & Cement Co., filed suit for damages. He claims that he was struck on the head with a falling rock from a blast while he was engaged as a member of a "stripping gang" in the quarry. It is the duty of the stripping gang to clean the dirt from the lime rocks before the blasts are set off. According to Smith's statement a blast was set off without warning and he had no opportunity to escape being struck by the falling stones.

In asking for damages, Smith says that the sight of his left eye has been seriously and permanently affected by the blow on his head and that he has continual headaches.

Cement manufacturers are urging consumers to secure their requirements in bulk, instead of in cotton or paper sacks. The increased cost of sacks as well as the decreased supply owing to enlarged Government requirements for cloth has added materially to the cost of shipment in cloth bags.

H. J. Seamans of Catasauqua, Pa., who built the Atlas Portland Cement plants and for a long time was general manager of the company, has ben named by A. Mitchell Palmer, the alien property custodian, as manager of the La Salle Portland Cement Co. (formerly the German-American Portland Cement Company) at La Salle, Ill. The La Salle plant has a capacity of a million and a quarter barrels yearly. He will leave for La Salle in a few days to take charge of the property.

Eight women are receiving $2.80 per day at Speed, Ind., where they are employed at the plant of the Louisville Cement Company. The wages paid the women are the same as paid to men, and company officers state their work is just as satisfactory.

Sioux City (Iowa) concrete paving and the details of its construction were investigated recently by a committee of citizens from Ogden, Utah, under the guidance of City Engineer T. H. Johnson. The committee was composed of William F. Long, a representative of the Portland Cement Association; O. J. Stillwell, secretary of the publicity bureau, of Ogden, and George Tracy, city engineer, of Ogden.

A contract involving the expenditure of $225,000 for the paving of two and one-fourth miles of main highway leading into Ogden caused the appointment of the committee of investigation, said Mr. Tracy. The paving will be 70 feet wide from curb to curb.

Steel reinforcement has been used in concrete paving that has been constructed in his city, and it has proved costly, Mr. Tracy further stated. The method of construction of concrete paving in Sioux City requires 40 per cent less cement as well as no steel reinforcement. The investigation was recommended by the representatives of the Portland Cement Association, and on account of the large expenditure involved in the contract, it was thought well worth while to seek the best construction.

# Rolling Concrete Longitudinally Gives Good Roadway

Much advance has been made during the past year in the use and development of the roller for finishing concrete roadways. Articles descriptive of several types of these rollers, as well as the application of the belt method of finishing highway concrete, have appeared in several issues of Cement & Engineering News, and it is felt that the type of roller developed by the writer while supervising New York State road construction at East Union, N. Y., is worthy of description, since the results obtained were so satisfactory and the roller itself was so simple in design. It consisted of a length of 2-in. wrought-iron pipe and successfully replaced the cumbersome screed, the back-breaking float, and the bulky "bridge."

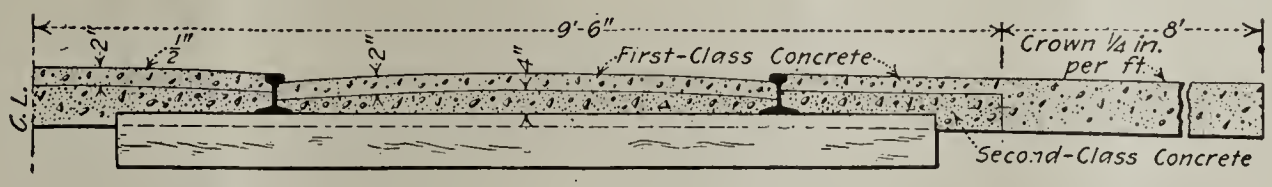
A one-course concrete roadway was being built at East Union in accordance with the New York State Highway Department standard for 1:1½:3 concrete. The roadway itself was 35 ft. wide, the middle 19 ft. being two-course concrete paid for by the street railway company, whose double tracks occupy the central portion. The contractor commenced the work with the usual paraphernalia, using two men to spread the concrete as it came from the mixer chute, three men to help the spreaders and work the screed, and one man who was occupied with the hand float continuously, although he had to work from one to two hours overtime and was occasionally assisted by the foreman. After a lot of argument and several days' work with the old implements, the writer finally persuaded the contractor to use a roller. Although an attempt was made to secure a length of 6-in. wrought-iron pipe, an experiment was finally undertaken with a section of 2-in. pipe taken from the water pipe line and filled with sand. The results were fully satisfactory—so much so that no further attempt was made to secure the 6-in. pipe.

With this improvised roller it was found that two men could do all the work of spreading and finishing the concrete. As the batch was deposited upon the subgrade it was spread with hoes a little high and then rolled into shape with this small pipe, which rested on the outside form of the road proper and the outside rail of the track. No attempt was made to attach a handle to this roller, it being found possible to push it ahead with the foot. Occasionally too much concrete would accumulate in front of the roller and it would have to be hoed away; or, conversely, when not enough concrete had been deposited, more would be placed. There was plenty of time, even with the decreased labor force, to roll the concrete several times, or until all the surplus water was squeezed out. If sufficient care was taken in this operation, the resulting surface did not require any further treatment. It was rough enough when opened to traffic not to require any brooming, and the slight corrugations which resulted from the use of the small pipe seemed to afford an excellent foothold for horses and to be hardly noticeable under motor-car traffic.

Later on an attempt was made to use an 8-in. wrought-iron pipe in place of the 2-in. pipe, and while it seemed to compact the concrete with less rolling, it had the disadvantage of requiring greater care if deep corrugations were to be avoided. Furthermore, it seemed to climb over excess concrete instead of pushing it ahead, as was the case with the roller of smaller diameter. Hard to handle because of its weight, the larger roller had a certain advantage when the concrete was mixed relatively dry, but if the concrete was plastic enough to slide down the chute there was no advantage that would compensate for its extra weight.

The success of the first 2-in. roller induced the contractor to procure rollers for finishing the crowned portion between the rails and between the two tracks. These rollers were failures mainly because they were not heavy enough. If the concrete was wet enough to be shaped by the roller, it would lose its shape immediately after rolling, while if it was stiff enough to hold its shape after rolling, the roller was not heavy enough to pack it to shape—the roller being turned out of an 8-in. square oak stick.

The Frank Sherman Contracting Co. of Oneonta was the contractor, H. E. Smith, division engineer, and the writer engineer in charge for the State Department of Highways.




DISTANCE FROM TRACK TO SIDE FORM SPANNED BY TWO-INCH PIPE ROLLER

# Concrete As a Housing Material for Industrial Workers

The broad concrete basis upon which industrial housing is being undertaken with particular relation to labor turnover, makes of vital importance a weighing of first cost as compared with ultimate costs. And so permanence and reduced upkeep as represented by concrete or brick are being sought rather than the slightly lower first cost that pertains to the frame building.

At the recent meeting of the American Concrete Institute, Mr. Leslie H. Allen, of the Aberthaw Construction Company, Boston, acting as chairman of the committee on industrial concrete houses, presented a report from which the following interesting extracts are taken:

The investigations of the committee have not shown that a concrete house can be built more cheaply than a wooden frame house. The relative cost of course varies in different localities according to the availability of different types of material, but speaking generally we find that the cost of a concrete house should run from 10 to 15 per cent more than the cost of a well constructed frame house.

The advocates of the concrete house must rely upon the superior merits of concrete as a material and not upon its low first cost.

Three principal types of concrete house construction are the concrete block, the precast house and the monolithic house. We have not pushed our studies into the stucco house or cement-gun covered house, which seem to be outside of the scope of the committee. The general conclusions of the committee as to the merits of the various methods are that for small jobs the concrete block house stuccoed on the outside is the best solution, but for large developments in which more than fifty or sixty houses are required the monolithic or precast types show an economy in cost and speed that should place them in the foreground.

In any type of concrete house construction difficulties are sure to be met with. Some of these are discouraging to the contractor entering this field and are likely to hinder its expansion unless faced and overcome. The

committee have thought it well to discuss them frankly in order to guard the novice against disappointment and failure, realizing as we do that these difficulties are incidental only and not insuperable. The successful work done is sufficient answer to any objects raised that concrete house construction is too difficult or impossible.

The committee has not come to any conclusion as to how much of the house should be built of concrete. Accordingly the members have prevented their divergent views in their papers rather than attempt to come to any agreement so quickly. It is certain that the concrete wall offers great advantage due to its fireproof, weatherproof and permanent qualities. It should be furred inside. It should cost about the same as a brick wall or slightly less. A concrete floor should cost about 18 cents per square foot more than a wood floor. Concrete with wood top surface about 30 cents per square foot more.

A granolithic floor is advocated by some on account of the ease of cleaning, but for poor families who cannot afford many rugs it is unsuitable and it is unhealthy for small children to play on a cement floor.

When concrete construction is used for constructing outside features like porch columns and roofs and molding, cornices and ornaments, the cost of the house is increased very quickly.

There is widespread interest in the concrete house today. There is not, however, much active demand for them, owing to the dearth of contractors experienced in concrete work who are entering this new field to create a supply. The majority of the small houses built today are built for quick sale by the vendor and not for investment. House building standards have been low. Competition in prices has been keen but quality has been a secondary consideration. The demand at the present time seems to be for a better type of construction—concrete meets this demand.

The housing program of the Government entrusted to the Shipping Board and the Department of Labor will set forth the standard of housing for many years to come. It is of the utmost importance that these standards should be higher than the low standards that now prevail and especially that the work done be of such permanent character that it may prove to be an adequate security for the funds expended and for long term mortgage bonds at low rates of interest.

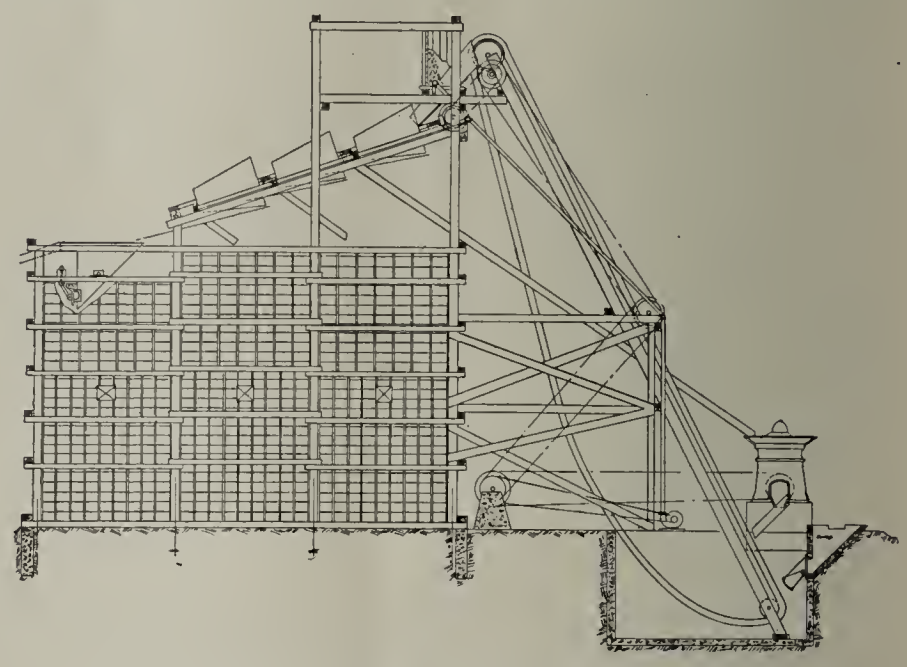
Good and sufficient housing is one of the most pressing needs of the nation at this time. Without it we are seriously handicapped in the winning of the war. The provision of good housing is not only an immediate need but a permanent national gain and that every member who lends his influence and aid to the securing of this end is rendering a real service to the nation.

## A New Idea in Dredging, Washing and Screening Sand and Gravel

The most economical and satisfactory equipment for producing sand and gravel in large quantities from deposits which lie under water is the heavy-duty sand and gravel dredging pump—especially when it is arranged to pump against a low head.

The common practice has been to pump the material directly into screens, located above the bins, into which the sized and washed products are deposited. As this involves lifting an immense volume of water unnecessarily, the consumption of power, and burden imposed on the equipment, are far greater than by the Channon process which is here illustrated. Here the pump lifts only high enough to discharge the material into a concrete sump, which is usually located on or below grade, and beneath the screens, as shown on drawing. Here the water drains off, and the dewatered sand and gravel passes to a continuous bucket elevator of Standard type, which lifts and discharges it into the first revolving screen.

Not only is the consumption of power minimized by this method, but of still greater importance is the reduction in head and pressure on both the pump and pipe line, leaks in gaskets and packing, and many other troubles, which develop when working under high

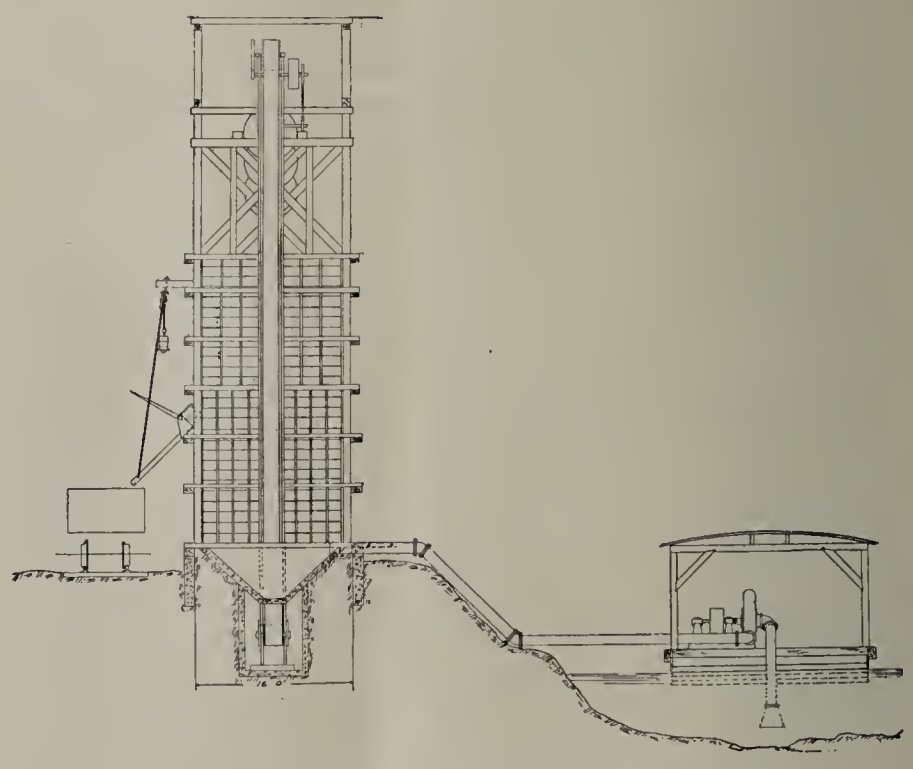


The Channon Gravel Dredger and Screener.

pressure, are eliminated. The plant is enabled to operate continuously and without interruption.

No departure has been made from the well known Standard practice, which has prevailed for many years, in either the type or arrangement of inclined conical screens. These and the Standard tilting type sand separator are also shown on the drawing.

The first screen usually has 1½-inch round perforations, and all material over that size is discharged from the small end, through a hole in the water pan,



The Channon Gravel Washer and Screener.

and passes by a chute to the crusher. From the crusher it passes back to the elevator and is again delivered to the first screen.

The washing process begins when the material which has passed through the perforations of the first screen is conveyed by the water pan to the second screen.

The second screen usually has ¾-inch and the third screen ¼-inch perforations, depending upon the sizes of gravel and coarseness of sand required.

Water, elevated by a small pump, is injected into the screens through pipe nozzles placed at the discharge end of each. This thoroughly washes the material and prevents it from clogging the spouts underneath the screens.

Sand, water, soil and other impurities, pass into the sand separator. When a given quantity, or weight, of clean sand has settled to the bottom of the separator, the valve opens automatically and discharges it into the bin, while the water, carrying the impurities, passes through the opening at top of tank and is carried away by the launder.

The plant described was designed and equipped complete by the H. Channon Company. The arrangement may be modified to suit local conditions and to give any capacity or separations required.

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**STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912,**

of Cement and Engineering News, published monthly, at 672 Transportation Bldg., Chicago, Ill., for October 1, 1918.

State of Illinois, County of Cook. ss.

Before me, a notary in and for the state and county aforesaid, personally appeared John F. Waldron, who, having been duly sworn, according to law, deposes and says that he is the business manager of the Cement and Engineering News and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor, and business manager are:

Publisher, William Seafert, 672 Transportation Bldg., Chicago.
Editor, William Seafert, 672 Transportation Bldg., Chicago.
Managing Editor, John F. Waldron, 672 Transportation Bldg., Chicago.

Business Manager, John F. Waldron, 672 Transportation Bldg., Chicago.

2. That the owners are: (Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning 1 per cent or more of the total amount of stock.)

William Seafert, sole owner, 672 Transportation Bldg., Chicago.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and condititons under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

JOHN F. WALDRON,

Sworn to and subscribed before me this 24th day of September, 1918.

FRANK W. McVICKER,
Notary Public.

(Seal)

(My commission expires Feb., 1920.)

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## Disc Friction Clutches

In a cement plant as much of the equipment as possible should be sufficiently simple so that it can be taken care of by ordinary labor.

This is a feature which has been taken into account in the design of the Plamondon disc type friction clutch, made by the A. Plamondon Manufacturing Co., 12-14 No. Clinton St., Chicago, Ill.

These clutches, while effecting easy, instantaneous and positive control of the power, are, nevertheless, so simple in design and construction that they can be taken care of by anyone.

The clutch acts with a double toggle movement, engaging and disengaging the clutch without the use of springs.

The company has a catalog especially covering these clutches which they will be glad to send to anyone interested.

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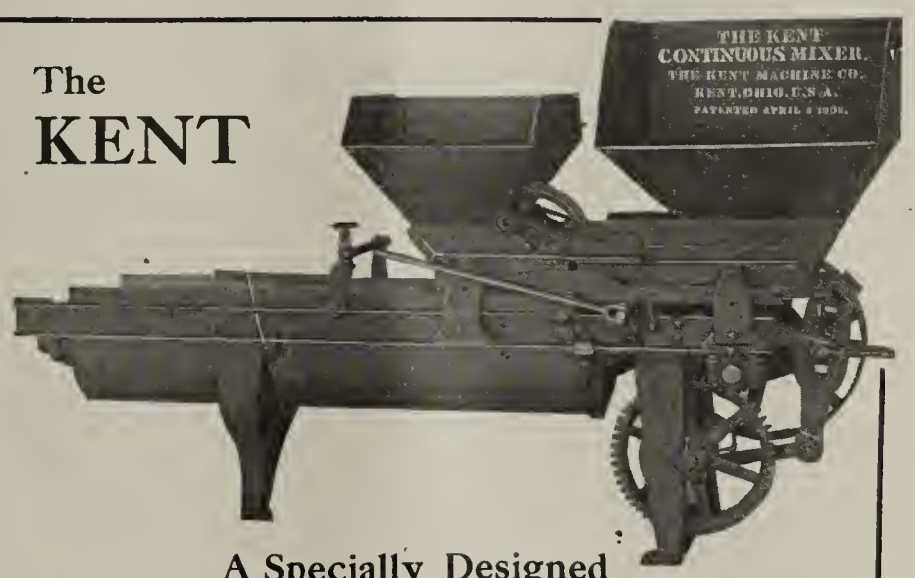
## Sand Pump Handles Screenings at Crushing Plant

A particularly efficient crushing plant is employed at the Ojus, Fla., quarries of Evert P. Maule. The stone is a caralline formation and unusually hard. It is dredged from under water by two 1½-cubic-yard dredges which load into 6-cubic-yard Western side dump cars. The present cut is over a mile in length and from 20 to 25 feet deep. At the crushing plant the loaded cars are hauled up a 40-foot incline railway to the two jaw crushers. The hauling is done by a 3-drum hoist, which also is utilized for spotting freight cars below the crusher. Each 6-yard car as it arrives at the top is dumped into a large hopper from which the stone is fed over a grizzly, the fine stuff dropping through, the coarse going into the crusher. As the rock is carried through the crusher heavy jets of water wash out the fine stuff. A steam pump on top of the plant washes out the cars. A 4-inch sand pump takes away the screenings, discharging them into a muck pond from which this fine material is loaded and shipped for various purposes, it having high cement qualities. The average output of the plant is 50 carloads of stone per day.

The
KENT




A Specially Designed
Mixer for Products Plants

Seventy per cent of the bigger block, tile, brick and specialty concrete products plants of the country use the famous Kent Mixer.

Equipped with automatic feeding device, it makes certain a proper proportioning of aggregates and being continuous in operation, it saves time and labor. The biggest concrete products plant in the world has found that four Kent machines will mix fast enough to keep its many tampers and mold machines busy.

**Write today for descriptive literature and prices.**

THE KENT MACHINE CO.
Kent, Ohio

# For More Efficient and Economical Blasting

Our service men have solved thousands of blasting problems, each presenting extraordinary difficulties. Their work has meant better and cheaper results in all sorts of blasting, from slicing off the side of a mountain to making a ditch. ATLAS service works all the time—in quarries, coal mines, ore mines, road and railway construction, tunneling, submarine blasting—anywhere.

## A Century's Experience

We have the benefit of more than a century of experience in making explosives. This experience we place at the disposal of every man who has to do with blasting. This service is given without reserve—there are no strings on it. It is service by experts backed by the entire ATLAS organization.

No job is too large, too small or too remote to merit and get the most intimate study and careful personal attention of ATLAS experts.

"Put your blasting problems up to ATLAS" is our standing invitation. It is also the often repeated advice of ATLAS customers to friends who have never tested ATLAS services.

## Tests Guarantee Every Pound

There is a proper ATLAS explosive for each blasting requirement. Our own complete chemical laboratory makes tests which guarantee every pound. Each type and grade of ATLAS explosives must be absolutely uniform month in and month out, year after year. Similar blasting results under similar conditions can be depended on always. Rigid ATLAS tests assure continuous satisfaction.

The result of this assurance of uniform quality and our zeal for thorough-going personal service to our customers is thus described by one of our customer-friends: "You are more than mere makers of explosives, you are guarantors of better blasting results at lower blasting cost."

# ATLAS POWDER COMPANY

**Home Office: Wilmington, Del.**

Sales Offices: Allentown (Pa.), Birmingham (Ala.), Boston, Chicago, Des Moines, Houghton (Mich.), Joplin (Mo.), Kansas City, Knoxville, McAlester (Okla.), Memphis, Nashville, New Orleans, New York, Philadelphia, Pittsburg (Kan.), Pittsburgh (Pa.), Pottsville (Pa.), St. Louis, Wilkes-Barre (Pa.).

**A PROPER EXPLOSIVE FOR EVERY BLASTING REQUIREMENT**

**Put your blasting problems up to us**

Our Service Department is a clearing house of blasting experience in all its phases and under all conditions. It is directed by experts who will personally help you apply this vast store of information to *your own blasting*. WRITE TODAY.

**Northwestern Steel Forms**

Save time, money and man-power on construction of tile, culverts, sewers, drains, flumes, etc. Standard and special sizes; round or elliptical. Recognized as standard, used and recommended by engineers and contractors everywhere. For full information ask for ***Bulletin 29.***

NORTHWESTERN STEEL & IRON WORKS *Capital $200,000* EAU CLAIRE, WIS.

**BELTING** "V-B" Balata "AMPERE" (Canvas Stitched) "WHITE SEAL"

Write for Prices, Discounts and Samples
VICTOR BALATA & TEXTILE BELTING CO.
Factory: Easton, Pa. Main Office: 38 Murray St., New York
Stores: 167 N. Market St., Chicago, and 87 High St., Boston
CONVEYOR BELTS A SPECIALTY

***Moderate in Price and with a Reputation for doing more than is claimed for them***

Jaeger Mixers **make** good because they are **made** good. No useless parts—no skimping. They are big enough for the big jobs and not **too** big to handle the little ones with profit.

And there's a Jaeger Mixer that just fits **your** needs. Let us tell you about it.

**The Jaeger Machine Company**

212 Rich St.
Columbus,
Ohio

# Is *Your* Plant Producing CEMENT TILE?

**DUNN EQUIPMENT**
TILE MACHINES
BLOCK MACHINES
CONCRETE MIXERS
SEWER PIPE MOLDS
CONCRETE PORCH AND CHIMNEY MOLDS
—and a complete line of concrete machinery

THERE is tile business waiting for you—at good profits, and without manufacturing difficulties.

Your plant can easily be made ready for tile making because you already have part of the equipment.

After harvest comes drainage; now is the time to get ready for big tile sales.

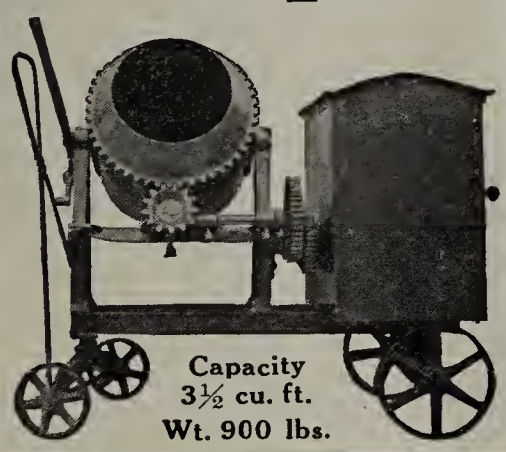
Dunn equipment is standard for making high grade tile easily, quickly and at good profits.

**GET THIS BOOK**

All the facts and figures on the tile business and Dunn equipment are in this book; write for a free copy.

**W. E. DUNN MFG. CO.**
414 24th Street HOLLAND, MICH.

# Republic Mixers will save you money




Before you buy a mixer, look over the Republic line. The prices are reasonable, the machines are ready to ship and the terms may be arranged to accommodate you. Line includes tilting and non-tilting types from 3½ to 10 cubic feet capacity, low charging, power loaders, etc.

## Power Mixer $160.00

This mixer is complete with all-steel construction, including truck, engine and housing. A bargain!

## Hand or Belt Mixer $55.00

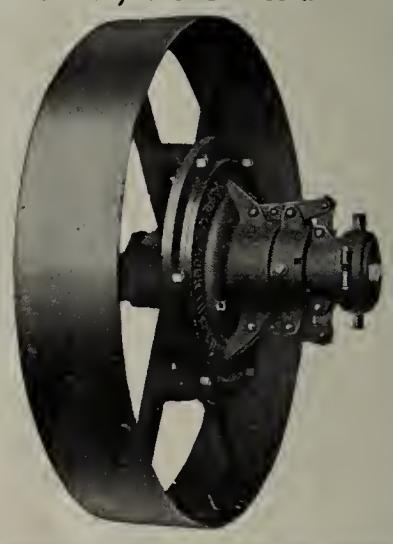
Write for the big Republic Mixer catalog.

**REPUBLIC IRON WORKS,** Box 454 TECUMSEH, MICH.

# LITTLE DAILY LEAKS OF POWER BOOSTS YOUR COAL BILL

The High Cost of Power Is Reduced to a Minimum By the Use of a

## Plamondon Disc Type Friction Clutch



The power of this clutch is unusual. The double toggles on this clutch develop such tremendous pressure that even on the largest clutches only a hand lever is needed to engage or disengage the clutch. The geared devices usually needed to operate large clutches are unnecessary.

This is only one of the practical advantages the cement mills find in this clutch. Write for our new catalog No. 59 and learn the rest of them.

WE ALSO MANUFACTURE GEARS

**A. Plamondon Mfg. Co.**

12-24 N. Clinton St. CHICAGO, ILL.

Cut Gears

Spur,
Spiral,
Bevel and Worm
Steel and Rawhide

*Accuracy and Prompt Delivery*

When you want a gear cut you want it **quickly,**—we emphasize our promptness without sacrificing accuracy.

## Ganschow Cut Gears

stand first in accuracy—perfect mesh—silent operation and the quality that counts for long service.

*Estimates furnished from drawings and specifications.*
*WRITE FOR CATALOG.*

**WILLIAM GANSCHOW CO.**

1003 W. Washington St. - CHICAGO

# Everything in CUT GEARS

We have the largest and most modern equipped gear making plant in the west. Our gear making machinery embraces everything known that will in any way facilitate the manufacture of high-grade cut gears of all kinds up to 15 feet in diameter.

**Quick Deliveries, Low Prices and First Class Work Our Motto**

## Foote Bros. Gear & M. Co.

**210 to 220 N. Carpenter St., Chicago**

# Pebbles for your tube mills

**Superior to Flint Pebbles and Will Not Break**

Tested by Engineers and Chemists
Shipments Promptly Made
Satisfaction Guaranteed

**Peruvian Tube Mill Pebble Co.**
152 Colmena Ave. LIMA, PERU

# BALLS

Forged steel balls of special analysis steel from 2" to 15" in diam. carried in stock. Can't be excelled.

BALL MILL PLATES
CRUSHER SHAFTS
GRIFFIN MILL SHAFTS
GRIFFIN MILL CONVEX SEATS
GRIFFIN MILL CROSSHEADS
PIPE FLANGES for High Pressure Work
STEAM SHOVEL, TRUCK AND CAR AXLES

**Hammer and Hydraulic Press Forgings of all kinds**

*We make quick service a feature of our business*

**TIOGA STEEL & IRON CO.**
52nd AND GRAY'S AVENUE, PHILADELPHIA, PA.

# IMMEDIATE DELIVERY

"Franklin"

ROUND—SQUARE—FLAT—SQUARE TWISTED

## STEEL BARS
for CONCRETE REINFORCING

We can meet your Reinforcing Steel Requirements. This means not only quick shipment from the mills but co-operative service for rapid transportation. If you want to know just what your exact cost will be, send us the Blue Prints and we will give you a lump sum bid on all the steel sheared to lengths, bent to specifications and delivered to the job,

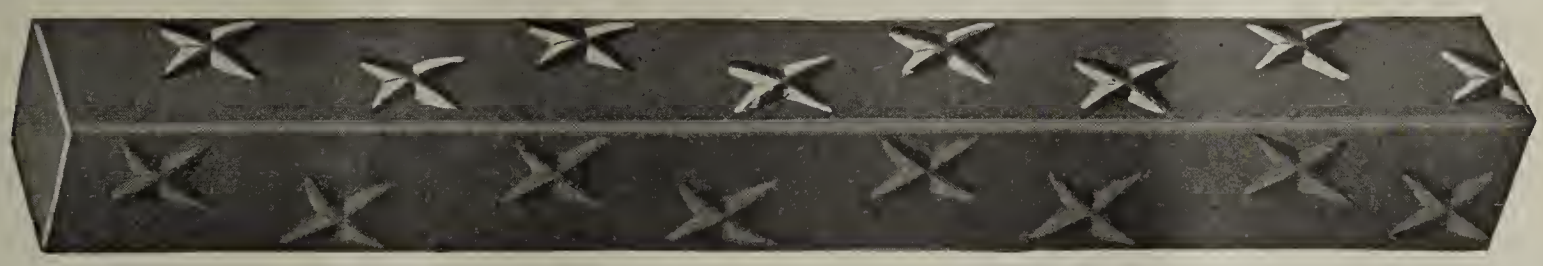
*Our Engineering Department is at your service.*

**The FRANKLIN STEEL WORKS**
FRANKLIN, PENNA.

Cleveland, 1320 Rockefeller Bldg.
Boston, - - 12 Pearl Street
Philadelphia. 2215 Race Street
New York, - 30 Church Street
Chicago, - - 332 So. Michigan Blvd.
Buffallo, - Erie County Bank Bldg.
Pittsburgh, Oliver Bldg.

QUALITY SERVICE

# Inland Deformed Bars



In Open Hearth Steel (New Billet Stock), Hard Grade, and Rail Carbon Steel (Rerolled).

The mechanical bond is theoretically correct and is guaranteed by us, having been designed by expert concrete engineers and approved generally by engineers and architects.

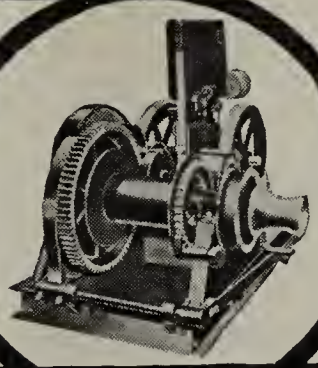
The corners are rounded to prevent splitting of the concrete. Bending, fabricating and setting are easily done with these bars. Sizes ⅜ to 1¼ inch. Lengths up to 85 feet.

Prompt shipments during 1918.

**INLAND STEEL COMPANY First National Bank Bldg., CHICAGO**

Boss "HEAVY DUTY"
## Contractors' Hoists

Gasoline — Kerosene or Electric Power—reliable as steam. Absolutely dependable. $5 to $10 a day cheaper to operate. Three sizes—6, 8, 10 H.P. Three speeds—100, 150, 200 ft. Rope Travel. Hyatt Roller Bearings. Prompt Deliveries. Write, wire or 'phone nearest branch office.



Over 100 Ordered for USE "SOMEWHERE IN FRANCE"

**THE AMERICAN CEMENT MACHINE CO., Inc., Keokuk, Iowa.**

BRANCH OFFICES—New York, N. Y.; Cambridge, Mass.; Richmond, Va.; Pittsburg, Pa.; Cleveland, O.; Indianapolis, Ind.; Louisville, Ky.; Chattanooga, Tenn.; St. Louis, Mo.; New Orleans, La.; Chicago, Ill.; Minneapolis, Minn.; Denver, Colo.; El Paso, Tex.; San Francisco, Calif.; Seattle, Wash.; Spokane, Wash

# Luten, Roberts & Titus
INDIANAPOLIS

*Designing and Consulting Engineer*

*Reinforced Concrete Bridges Exclusively*

**Associate Engineers in each State**

BECAUSE WE SPECIALIZE ON

**Lock Seam Pipe** with the smooth inside surface, having already furnished large quantities for Potash Recovery plants, we are able to give especially careful attention to the construction of this class of Pipe.

**Robertson Bros. Mfg. Co., Chicago**

# LAST WINTER
## Had It's Problems

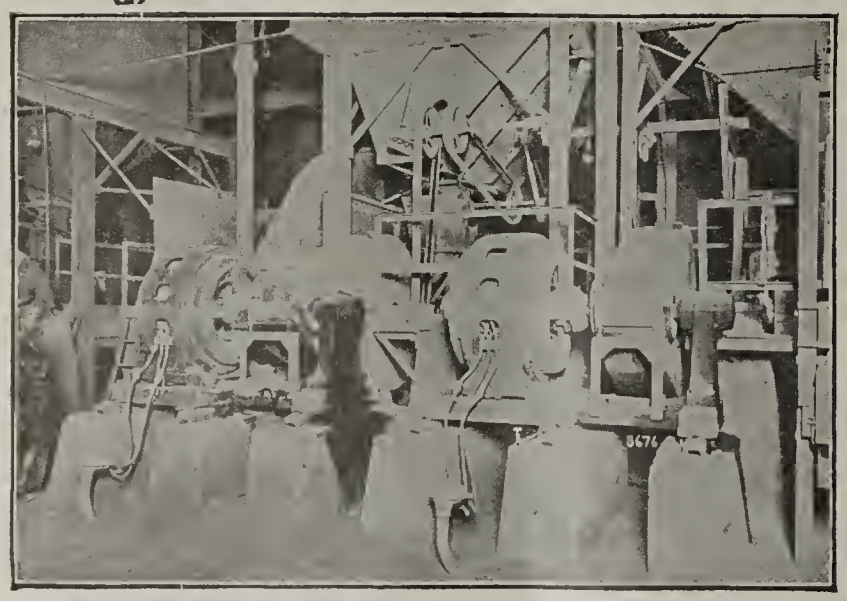
The *lack of coal* in our nation's factories, caused either complete shutdowns or serious delays on urgent orders. It was *then,* that plant-owners realized that central station power would have assured them of much better operating conditions:

*First:* The wide use of central station power *reduces the number of points* to which coal must be distributed. Thus, power is not only guaranteed to the average user, but the expense of an individual power plant is eliminated and here results a saving of freight cars and fuel that will help win the war.

*Second:* Central stations, specializing in power production, and *possessing larger and more efficient generating equipment,* can *supply* power cheaper than the average user can *produce* it. To the progressive manufacturer who conducts his business on the principle that quantity production decreases costs, what truth could be more evident? Employment of the electric drive means

## Less Worry About Coal Piles

*Westinghouse Induction Motors driving tube mills at the plant of the Pennsylvania Cement Co., Bath, Pa.*



The advantages to be gained through electrification, can be best guarded and maintained with the use of rugged, lasting and always dependable

## Westinghouse Apparatus

Westinghouse cement mill experts will be glad to consult with you.

**Westinghouse Electric & Mfg. Co.**
**East Pittsburgh, Pa.**

# Westinghouse

# STEEL BARS FOR Reinforcing Concrete

OUR SERVICE
ESTIMATING
SETTING AND BENDING DETAILS
BENDING

PLAIN AND DEFORMED ROUNDS AND SQUARES

Shipments from Stock and Mill Rolling

## CALUMET STEEL COMPANY

CONTINENTAL AND COMMERCIAL BANK BUILDING
CHICAGO

## THE FULLER ENGINEERING COMPANY

**Designing, Constructing and Operating Engineers**
**Cement and Hydrated Lime Plants a Specialty**

**Reports, Examinations and Analyses of Raw Materials for Cement Consultations Solicited**

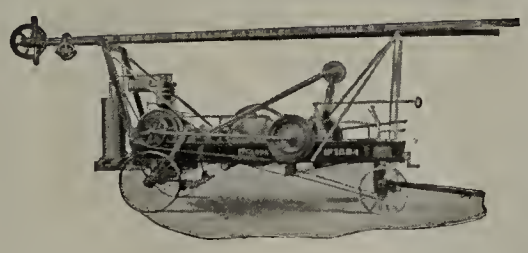
**Offices: Allentown National Bank Bldg.**
**ALLENTOWN, PA.**

# WATER

WE-FU-GO AND SCAIFE
PURIFICATION SYSTEMS
SOFTENING & FILTRATION
FOR BOILER FEED AND
ALL INDUSTRIAL USES

WM. B. SCAIFE & SONS CO. PITTSBURGH, PA.

## A Big Blast-Hole Drill That's Reliable



### The Cyclone No. 14

Heavy, solidly braced frame — Sill timbers 4" x 14". All machinery placed directly on the main sills protecting it against strains and preventing top heaviness. **Eighty per cent (80%) of the castings are cast steel**—not cast iron. The Cyclone No. 14 is the only Blast-Hole drill so built. Furnished in Steam, Gasoline, Compressed Air or Electric Power; traction or non-traction.

**The Sanderson Cyclone Drill Co., Orrville, Ohio**
**Eastern and Export Office, 50 Church St., New York, N. Y.**

# PULVERIZED COAL EQUIPMENT

AERO PULVERIZER CO., 120 BROADWAY, N.Y.

## WOULD YOU USE AN INTERMEDIATE SYSTEM FOR CONVEYING YOUR FINISHED GRAVEL FROM PLANT TO CAR IF YOU COULD SPOT THE CAR UNDER THE SPOUTS OF THE BIN?

Not If You Could Help It Would You?

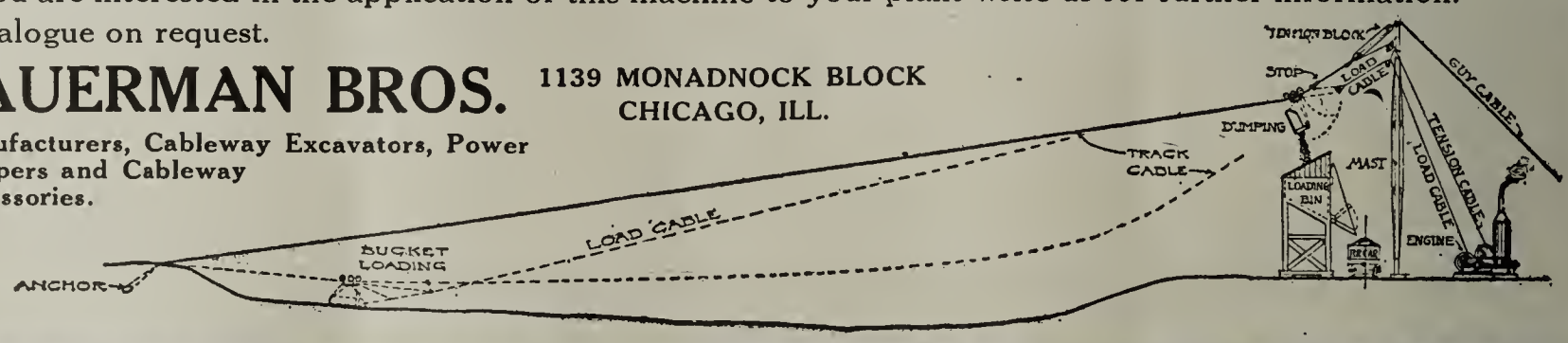
Then is it not just as logical to do away with an intermediate conveying system between **pit** and plant?

Are you using one machine for digging the material and another to convey it to the plant when you could just as well use one machine for the combined operation, saving the additional labor, machinery and upkeep cost?

The Sauerman Dragline Cableway Excavator is digger, conveyor and elevator combined in one.
It is the direct method from pit to plant.
It digs, conveys, elevates and dumps in one continuous forward operation.
Operated by a double drum friction hoist under one man control.
One Machine—One Operation—One Man Control
If you are interested in the application of this machine to your plant write us for further information.
Catalogue on request.

**SAUERMAN BROS.** 1139 MONADNOCK BLOCK CHICAGO, ILL.

**Manufacturers, Cableway Excavators, Power Scrapers and Cableway Accessories.**



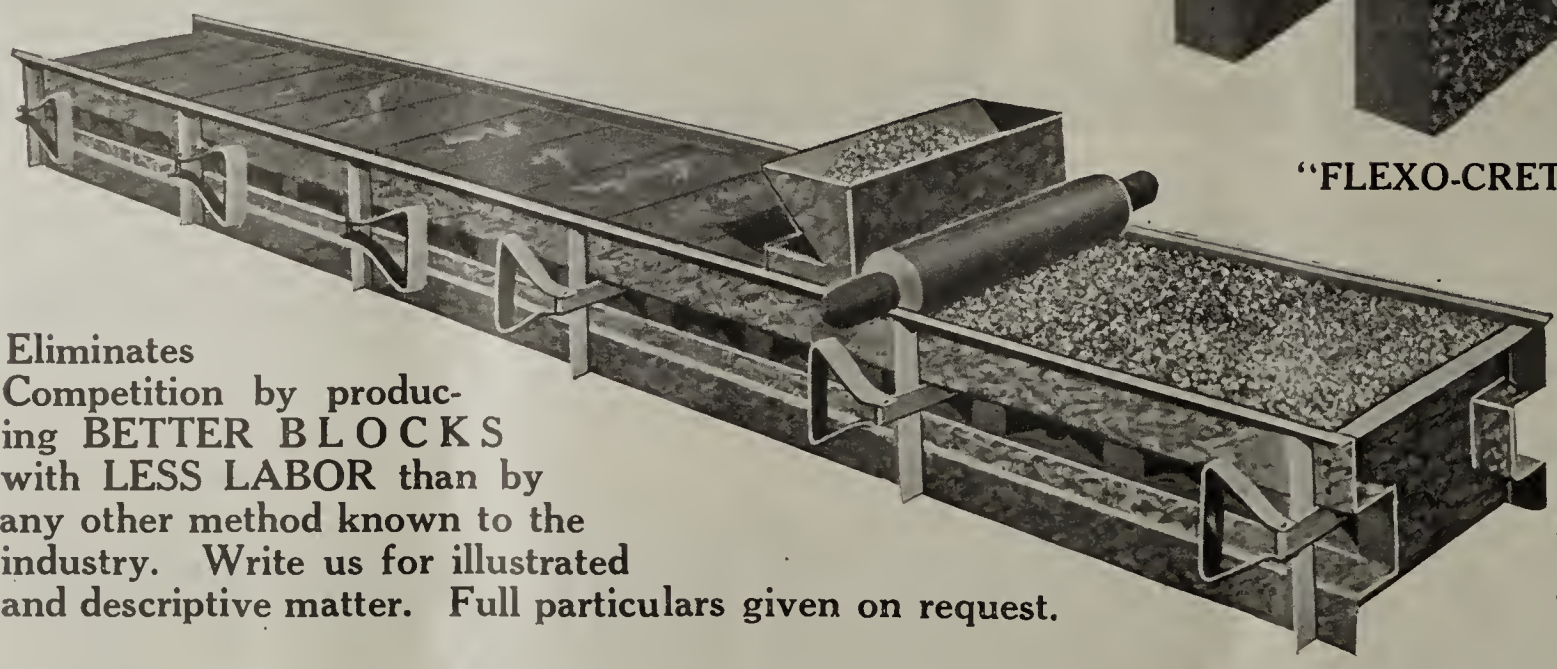

# Flexo-Galvanized Steel Moulds

For Producing

# Poured Concrete Building Stone

Greatest Labor Saving Device of the Times.
A God send to the Building Block Industry.

"FLEXO-CRETE"



Eliminates Competition by producing BETTER BLOCKS with LESS LABOR than by any other method known to the industry. Write us for illustrated and descriptive matter. Full particulars given on request.

*We ship on thirty days trial to responsible parties.*

**Flexo-Concrete Mould Company.** **Cedar Rapids, Iowa**

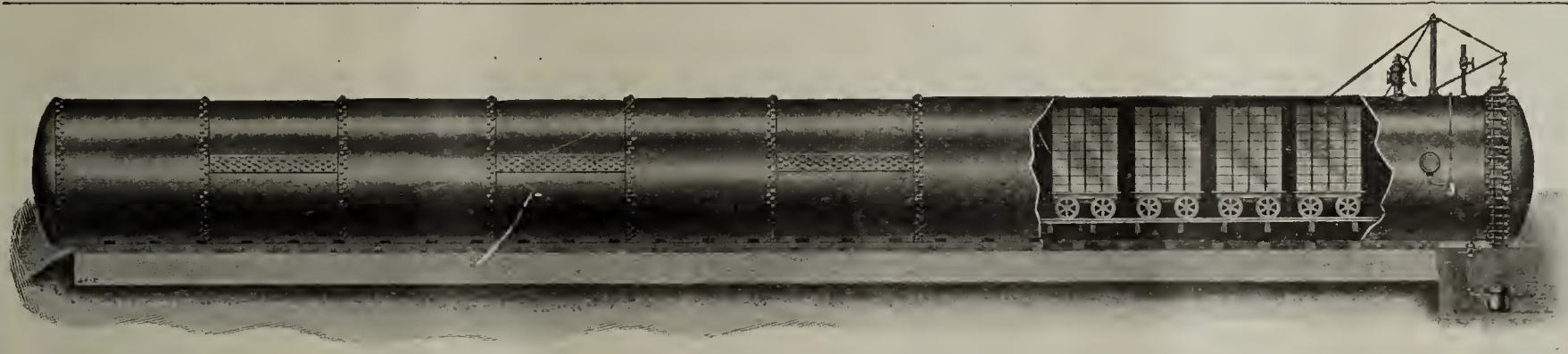
# Sand Lime Brick Machinery

Our complete line of Sand Lime Brick Machinery makes it possible to secure just that machinery which is required to make your plant a success. We favor no particular type of machinery but are guided by the needs of the customer. Our wet and dry grinding mills have transformed a number of unsuccessful plants into dividend producers, while our Presses, Mixers, Hardening Cylinders and other equipment are of equal quality. We can exactly meet the demands of any manufacturer with a quality of machinery which will operate at a profit with a minimum amount of attention and expense.

*Correspondence solicited*

## The American Clay Machinery Co.

**WILLOUGHBY, OHIO**



## EXCEPTIONAL OPPORTUNITY

# Complete Cement Plant

## Capacity 750,000 Bbls. Annually

**LOCATION, BEDFORD, IND.**

We own and offer for sale the above plant and offer it either as a whole or in part. Quotations will be made on any parts desired. Buildings:

Raw Material Building.....130x135 ft.
Raw Material Annex Building... 43x 90 ft.
Rotary Kiln Building..... 95x180 ft.
Coal Drying and Grinding Bldg.. 58x 80 ft.
Dry Grinding Building..... 90x114 ft. 5 in.
Storage Warehouse ..... 80x250 ft.
Boiler and Power House..... 91x100 ft.
Repair Shop ..... 30x119 ft.
Coal Storage Building..... 25x100 ft.
All buildings structural steel with brick walls.

2—300 H.P. Cahall Vertical Water Tube Boilers.
4—250 H.P. Geary Water Tube Boilers.
1—375 H.P. Heine Boiler.
All 160-lb. pressure.
1—1000 K.W. Vertical General Electric-Curtis Turbo-Generating Set.
1—800 K.W. Vertical General Electric-Curtis Turbo-Generating Set.
Both sets 3 phase, 25 cycle, 480 volts; one complete switchboard panel for the above, also condenser for the turbines, circulating pumps—everything complete and now in position.

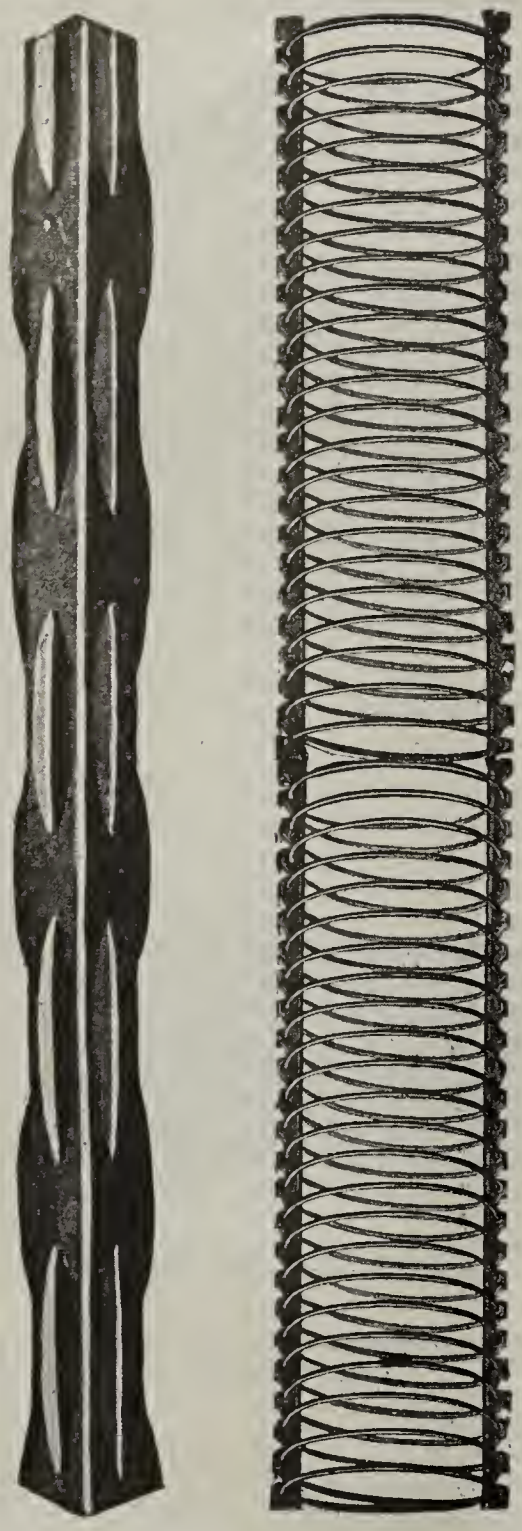
20—10-ton steel hopper dump cars.
2—Austin No. 6 Gyratory Late Type Crushers, with elevators, screen, etc.
1—60 in. x 50 ft. Moser Dryer.
2—60 in. x 40 ft. Sinker Davis Dryers.
1—Allis-Chalmers set of Anaconda Rolls, sizes 40x15 in.
3—5x22 ft. Gates Tube Mills.
32—30-in. Griffin Pulverizing Mills.
10—Allis-Chalmers Rotary Kilns, 7 ft. to 5 ft. 6 in. x 60 ft., complete with Automatic Kiln Feeder Boilers, coal pulverizing equipment, etc.

Besides the above, the plant is equipped with all the necessary conveyors for material, elevators, all copper wire for transmitting current, laboratory complete, office buildings, stone quarry, shale quarry, sidings, workmen buildings and approximately 325 acres of Real Estate.

*For Prices and Full Particulars Address*

## McCOY-BRANDT MACHINERY COMPANY

**216-218 Penn Avenue, Pittsburgh, Pa.**



STEEL
BARS
AND
SPIRALS
FOR
REINFORCED
CONCRETE
CONSTRUCTION

# "Bars on the Job Ready for Your Men"

Delay, caused by the failure to have your reinforcing material on the job not only throws out your calculations but also the schedule of every other contractor on the job.

You can save the loss of much time and money by specifying Havemeyer Bars for your reinforced concrete work.

Their prompt service insures your having bars on the ground when the men go to work.

## HAVEMEYER BAR

Service insures direct shipments of reinforcing steel from our Chicago warehouse, which is located within easy teaming distance of the loop and makes delivery when material is needed.

Havemeyer Products, Bar-Tys, Bar-Spacers, Ty-Chairs, Beam-Saddles, Etc., keep the steel in its right place while the concrete is being poured.

*Try Our Service*

## CONCRETE STEEL CO.

MONADNOCK BLDG. CHICAGO

# INVESTIGATION AND EXPERIENCE ARE PROVING THE RELIABILITY OF HYDRATED LIME

## FOR WATER PROOFING AND TO FACILITATE POURING CONCRETE

In these 51 concrete storage tanks, recently erected in Cedar Rapids, Iowa, by the Quaker Oats Co., there are approximately 12,500 cubic yards of concrete—1-2-4 mix. The walls are perfect cylinders, with no lips or bulged surfaces.

Hydrated lime was used for waterproofing and also to facilitate pouring the concrete and lifting the forms, owing to its lubricating properties. In mixing, 25 pounds of hydrated lime was put into each batch, which made the percentage of lime to cement a little over 8% by weight. The mixers used were of such size that three bags of cement could be used in each batch.

Considerable credit is given by the Leonard Construction Co. of Chicago to the lime. The statement is made that the lime gave the exterior surface a white and uniform appearance, and that the surface needed no subsequent coating. There were no joints where the concrete stuck to the forms and "lifted," as it does in many cases where the concrete is not of uniform mixture.

***Write any of the following competing manufacturers of Hydrated Lime for complete informatoin about Hydrated Lime in Concrete***

**Marblehead Lime Co.,** Chicago—Kansas City

**Glencoe Lime & Cement Co.,** St. Louis, Mo.

**The A. & C. Lime Co.,** Canton, Ohio

**John D. Owens & Son Co.,** Owens, Ohio.

**Port Byron Lime Assn.,** Port Byron, Ill.

**Ste Genevieve LimeCo.,** St. Louis, Mo.

**Kelley Island Lime & Transport Co.,** Cleveland, Ohio

**Woodville Lime Products Co.,** Toledo, Ohio

**TidewaterPortlandCementCo.,** Baltimore, Md.

**Palmer Lime & Cement Co.,** 103 Park Ave., New York, N. Y.

**National Lime & Stone Co.,** Carey, Ohio

**Merion Lime & Stone Co.,** Norristown, Pa.

**Lee Lime Co.,** Lee, Mass.

**Rockland & Rockport Lime Co.,** New York—Rockland, Maine—Boston

**Ohio Hydrate & Supply Co.,** Woodville, Ohio

**Vermarco Lime Co.,** West Rutland, Vt.

**Riverton Lime Co.,** Riverton, Va.

**Union Lime Co.,** Milwaukee, Wis.

# For Sale

500 tons new O. H. 105 lb. NYC standard rails with splices.

1000 tons new O. H. 90 lb. ASCE rails with splices. Will quote on entire quantity or on such lots as required for prompt shipment.

**M. MITSHKUN CO.,**
BOOK BUILDING
DETROIT, MICHIGAN

LOCOMOTIVE CRANES
STEAM SHOVELS
LOCOMOTIVES
CARS
RAILS
HOISTING ENGINES
GRAB BUCKETS
STONE CRUSHERS
COMPRESSORS
ETC.

Try us for honest value in dependable "used" material of this character. We'll treat you right.

**Wm. B. Grimshaw Co.**
1052 Drexel Bldg., Phila., Pa.
Dealers in "Used" but "Not Abused" Machinery

FOR SALE
# Rebuilt Machinery
**For Immediate Delivery**

1—16x32x42 Cross-Compound Murray Rolling Mill Corliss Engine, belt drive.
1—400′ Worthington Surface Condenser.
2—66″x16′ Tubular Boilers.
1—16x36 Double Eccentric Heavy-Duty Fulton Corliss Engine, belt drive.
1—14x20 Atlas Automatic Engine, belt drive.
1—40x60 No. 10 gauge Steel Stack.
1—36x70 No. 10 gauge Steel Stack.
1—5x7½ Vertical Throttling Engine.
1—Induced draft Fan, 60″ diameter, 30″ outlet—steam driven.
1—20x34x28 Tandem Compound Fitchburg Engine, direct connected to 300 KW. direct-current G. E. generator.
1—450 KW. G. E. Alternator, 2300 volts, 3 phase, 60 cycle, direct connected to E. P. Allis Cross Compound Engine; steam driven surface condenser with switchboard panel and instruments.
1—800 KW. G. E. Alternator, 2300 volts, 3 phase, 60 cycle, direct connected to McIntosh & Seymour horizontal heavy-duty engine, 100 RPM.
1—New 350 HP. IXL Open Feed Water Heater, purifier and receiver, with cut-out valve and oil separator.

**H. J. GEBHARDT**
**1421 FISHER BUILDING** **CHICAGO**

*New and Second Hand Bargains*
# CARLIN'S
SHEARS DERRICKS
GRINDING PANS
ELECTRIC HOISTS
BUCKETS
*Same location for 69 years*
**JOHN H. CARLIN MACHINE CO.**
140 Lacock St., N. S., Pittsburgh, Pa.

# For Sale by Owner

1—American Hoist Engine, 5½″x8″, D. C. D. D., with Sleuthing Attachment & Boiler.
1—No. 5 AUSTIN Gyratory Crusher.
600′ 1¼″ Plow Steel Cable.
1—INGERSOLL-RAND Air Compressor, Imperial type 10, Double Stage, 12x12 & 7½x12, capacity 327 Cubic Feet, direct connected to General Elec. 50 H. P. Motor with Auto Starter and including Receiver Tank and Automatic Unloader.
1—All Steel Derrick with Bull Wheel, and Interchangeable Boom for lengths 30′, 60′, 90′ and 110′.
1—General Elec. 50 H. P. Motor, A. C., 2 phase, 860 R. P. M.

**BETTENDORF STONE COMPANY**
**820 Kirkwood Blvd.** **Davenport, Iowa**

# Scrap Cement Bags

We are in the market for an unlimited quantity of scrap cement bags. Write or wire prices, stating quantity and whether dusted or not.

**Clayton Shoddy & Cotton Mills**
CLAYTON, N. J.

FOR SALE
## SMALL RODS

18 tons ¼-in. plain squares, 8—21 lengths.
20 tons ¼-in. plain rounds, 8—21 lengths.
20 tons ¼-in. deformed squares, 8—30 lengths.
30 tons ¼-in. deformed square, 8—30 lengths.

Immediate stock shipment, cut to lengths if desired. Will sell any part or all, also a miscellaneous quantity of larger rods.

**MODERN ENGINEERING CO.**
19 So. La Salle St., Chicago, Ill.

17—12-yd. Western
## DUMP CARS
excellent condition, $1050 each.

3—Stg. gg.
## LOCOMOTIVES
1—50-ton, 6-wheel switcher, $6500.
1—30-ton 4-wheel switcher, $5500.
1—50-ton 6-wheel switcher, $10,000
*All excellent condition, ready for immediate service.*

**THE FRED R. JONES CO.**
**City Hall Square Bldg., Chicago.**

# WANTED RAILS

80 lbs. 85 lbs. 90 lbs.
100 lbs. with angles

***Wire us what you have to offer***

**The Fishel & Marks Co.** **Cleveland, O.**
Pittsburg Chicago Detroit

# Relaying Rails

We have for immediate shipment:
250 tons of 30-lb. Relaying Rails.
150 tons of 35-lb. Relaying Rails.
Complete, with splice bars.
Atlanta (Ga.) delivery.

***Write or Wire for Price***

**The Isaac Joseph Iron Co.**
**525 Reading Rd.** **Cincinnati, O.**

# EQUIPMENT BARGAINS

## FOR SALE—IMMEDIATE DELIVERY

The following equipment in first-class operating condition, used on our completed contract for the construction of the Fourth Lock at Sault Ste. Marie, Michigan, for the United States Government:

35—Western, 5-yd., heavy-duty, two-way, 36-in. gauge **dump cars.**
26—Lakewood, two-line, bottom dump, **concrete buckets,** 65 cu. ft. capacity.
2—Owen type "H" **clam shell buckets,** 2 cu. yd. capacity.
1—Chicago Pneumatic Tool Co. **air compressor,** 164 cu. ft., 100-lb. pressure, with receiving tank.
1—Steel **stiff-leg derrick,** 25-ton capacity, 80-ft. boom, with bull wheel.
4—**Steel guy derricks,** 10-ton capacity, 80-ft. mast, 70-ft. boom.
1—**Traveling derrick,** 25-ton capacity, 80-ft. steel boom, with bull wheel.
1—Thomas double-drum **electric hoist,** with 100-hp. D. C. motor.
1—Patone **steel chain elevator,** 35-ft. centers.
1—Dean **steam condenser,** 8x14x12.
12—Koppel **steel flat cars,** 19 ft. x 4 ft. x 8 in.; 36-in. gauge; 30,000-lb. capacity.
2—**Ransome mixers,** 2 cu. yd. capacity, with 50-hp. A. C. motor.
1—Erie 16x18 stationary **horizontal engine.**
1—Leonard-Ball 7x10 stationary **horizontal engine.**
4—Leyner-Ingersoll piston type **steam drills.**
2—Ingersoll-Rand "Bull Moose" BCR type **drill.**
1—Ingersoll-Rand "Jap" BCR type **drill.**
4—Ingersoll-Rand **rock drills,** complete with weights and tripods.
1—Yeoman's 4-in., class "M," double-suction horizontal **centrifugal pump,** capacity 500-G.P.M.
1—**Belt conveyor,** for handling crushed stone.

*For further particulars, address*

**OSCAR DANIELS CO., First National Bank Bldg., Chicago, Ill.**

## Sound Plant in Good Operating Condition For Sale

### AIR COMPRESSORS

1—2-cylinder 6x6 belt driven Gardner-Rix, capacity, 80 ft. per minute.
2—Ingersoll-Sergeant Class A, 18 x 8¼ x 24 Straight Line, steam-driven, 650 ft. per minute at 100 lb.
1—Rand Duplex, steam-driven, 600 ft. capacity with receiver.

### BOILERS

4—50-hp. locomotive type.
4—Vertical tubular. 1—12-hp. 1—15-hp. 1—20-hp.

### CABLEWAY

1—Lambert, 6-ton, 900-ft. span.

### CENTRIFUGAL PUMPS

1—18-in. Morris direct connected to double vertical steam engine.
1—10-in. Buffalo, double suction, belt driven.
1—15-in. Buffalo, belt driven.
1—20-in., belt-driven Worthington Turbine.

### DUMP CARS

20—3-yd. Peteler, 36-in. gage.
20 pairs of wheels and axles, for 4-yd. Western, extra heavy, brand new.

### ROCK DRILLS

100—McKiernan-Terry "Wizard" Rock Drills, 2¼ to 3-in., with tripods for air or steam, all brand new.

### FIRE PUMP

1—Worthington Duplex Fire Pump, 18½x9¼ x10, capacity 610 gallons per minute.

### CONCRETE MIXERS

2—Ransome, 1-yd. on skids, with steam engine, but no boiler.

### HOISTING ENGINES

1—10x12 Lidgerwood compound geared to drum 41x52-in. Has 25-ton pull. Suitable for mine work.
2—American, 7x10, double cyl., 2 drum, with boom swinger, but without boiler.
2—7x10 American D. C. D. D., with swingers and boilers.

**Locomotives, Drills, Pumps, Steam Shovels, Etc.**

***All thoroughly overhauled and ready for immediate and constant service.***

**UNITED STATES EQUIPMENT CO.,** 208 South LaSalle Street, Chicago.

**LIME KILNS** **HYDRATED LIME PLANTS** **PORTLAND CEMENT PLANTS**

# RICHARD K. MEADE

**Chemical, Mechanical and Industrial Engineer**
**202 N. Calvert St., Baltimore, Md.**

**CEMENT TESTS** **CHEMICAL ANALYSES** **REPORTS ON MINERAL PROPERTIES**

PRACTICALLY NEW

## Used Crushing Equipment FOR SALE

1—Set 42x16" "Superior" Crushing Rolls.
1—Set 36x16" "Superior" Crushing Rolls.
1—Set 36x16" "Chalmers & Williams" Crushing Rolls.
1—Set 24x14" "Chalmers & Williams" Crushing Rolls.
2—No. 5 "Chalmers & Williams" Gyratory Crushers.

Good price, good condition, subject to inspection and immediate shipment.

**Galena Iron Works Corporation**
GALENA, ILLINOIS

## STEAM SHOVEL

Marion Model No. 20 with 1 1-4 yard dipper as good as new. Can make immediate shipment.

**CALUMET IRON & METAL CO.**
**4022 S. Wells St., Chicago, Ill.**

## BARGAINS Immediate Delivery

### HOISTS

8¼x10 in. Morrison, D.C., D.D.
7 x10 in. Stroudsburg, D.C., S.D.
9½x12 in. Lambert Cableway Engine

### ELECTRIC HOISTS

75 H.P. Flory, 3 drums and swinger, 440 volt, 60 cycle.
40 H.P. Lambert, D.D., 220 volt, D.C.
21 H.P. Lidgerwood, D.D., 550 volt, D.C.

### CRUSHERS

9x16 in. Climax.
10x22 in. Climax.
9x15 in. Champion
No. 5 Austin
Also several rotary screens

### BUCKETS

6—2½-yd. Lockwood bottom dump.

### COMPRESSORS

16x16x24x18 in. Ingersoll, 2 stage
10x 8x10x16x10 in. McKiernan, 2 stage
12x12x18 in. Laidlaw, straight line
12x12x12 in. Ingersoll, straight line
10x12x10 in. Ingersoll, straight line
16x10x10 in. Ingersoll, 2-stage, belt driven

**Also Pipe, Suction Hose, Etc.**

**WICKES MACHINERY CO.**
Claremont and West Side Aves.
Jersey City, N. J.

## FOR SALE—Prompt Delivery

8½ Miles 24-in. gauge Koppel Track.
1 Climax Geared Locomotive, 24-in. gauge.
1 6-in. Morris Centrifugal Direct Connected Pump.

**Western Contractors Supply Company**
41 South Canal Street Chicago, Ill.

One No. 4 March-Capron Concrete Mixer, without power, weight 7,000 lbs. Price 4c lb.

One Steel Cage, Hoppers, Wire Rope, etc., 5c lb.

One 5,000-lb. capacity two-drum Thomas Electric Hoist with 50 H.P. Motor; needs repair; $750.00.

One 28 H.P. Charter Gasoline Engine, $350.00.

**TEUSCHER & SON MCHY. SUP. CO.,**
**St. Louis, Mo.**

# FOR SALE—PROMPT DELIVERY

## *Owned By Us and Sold Under Absolute Guarantee*

### STEAM SHOVELS

1—95-C Bucyrus, shop No. 1304.
4—70-C Bucyrus, shop Nos. 1552, 1298, 1287, 1126, 2½-yd. dippers.
1—Standard 70-ton Bucyrus, shop No. 733, 2½-yd. dipper.
1—45-C Bucyrus, shop No. 1202; 1¾-yd. dipper.

### REVOLVING TRACTION SHOVELS

1—Model 28 Marion, ⅝-yd. dipper; shop No. 2988. Has moved 80,000 yd. Good as new; immediate shipment.
1—0 Thew traction shovel, shop No. 1002, ⅝-yd. dipper.

### DRAG LINES

2—No. 2 Monighan steam-operated all-steel draglines, 60-ft. booms, one 2-yd. and one 1½-yd. Page bucket, mounted on skids and rollers.
3—Class 24 Bucyrus Steam Drag Lines on skids and rollers; 100-ft. boom, 3½-yd. bucket. Shop Nos. 763, 764, 772. Built new in 1913 and 1914. As good as new; immediate shipment.

### DUMP CARS

25—16-yd. standard gage Western air dump cars, with steel lined floors.
22—12-yd. standard gage Western air dump cars.
2—12-yd. standard gage Oliver side dump cars.
9—6-yd. standard gage K. & J. side dump cars.
60—4-yd., 36-in. gage Western.
30—1½-yd., 24-in. gage.

### LOCOMOTIVES

1—18x24 cylinder, 10-wheel locomotive, weighing 55 tons, with 42 tons on drivers; built by American Locomotive Co. in 1907; steam pressure 170 lb., rigid wheel base, 10 ft. 2 in., wheel centers 44 in. in diameter. Most modern locomotive receiving general overhauling.
1—18x24, 10-wheel Baldwin, weighing 54 tons, with 42 tons on drivers; steam pressure 180 lb., diameter of driving wheel centers 50 in., rigid wheel base 13 ft. 10 in., overhauled Oct., 1917. First-class condition.
2—Standard gage 10x16 Davenport Saddle tank locomotives, weighing 19 tons, 1 65 lb. steam pressure, steam brakes and automatic couplers; locomotives built in 1917. Good as new.
2—Standard gage Davenport Saddle Tank Locomotives, weighing 18 tons, 150 lb. steam pressure, steam brakes and automatic couplers.
10—36-in. gage, 10x16 and 9x14 Davenport saddle tank locomotives.

### RAIL, SWITCHES, SPIKES, ETC.

1—Carload 4½-in., 5-in. and 5½-in. spikes.
10 tons angle bars for 70-lb. and 75-lb. rail.
10 tons 20-lb. rail with splices.
40 tons 52-lb. rail.

### SHOP EQUIPMENT

3—Brownell, 72 in. x 18 ft. Horizontal Tubular Boilers, with 4-in. tubes.
2—20 x 22¼ x 14¼ x 21 AA2 Ingersoll-Rand Compressors, complete with fittings.
1—20 x 22¼ x 15¼ x 21 AA1 Ingersoll-Rand Compressor.
1—66 x 18 Vertical air receiver, complete.
1—30 x 6 Vertical air receiver, complete.
1—16 x 16 x 18-in. Laidlaw-Dunn-Gordon Air Compressor with reservoir, weight 15,000.
1—Stationary Engine; horizontal center crank type; 10 x 12 in. cylinder, slide valve type; 25 hp.

## CLAPP, NORSTROM & RILEY EQUIPMENT CO.

**12 and 14 South Canal St., Chicago, Illinois**

**Northwestern Branch: 1308 Pioneer Building, St. Paul, Minn**

### QUARRY FOREMAN WANTED

"First class quarry foreman wanted" for Cement plant quarry in west. Address A. B. C., c/o Cement and Engineering News, 672 Transportation Bldg., Chicago, Ill.

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Wanted, First-Class Rock Quarry Foreman, a real man who can take charge of a quarry and actually knows how to get the rock out and push the work. Address Canadian Cement Manufacturer, care of Cement & Engineering News, 672 Transportation Bldg., Chicago.

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Wanted for sand plant, a machinist or millwright who is familiar with a boiler, engines, etc., and competent to repair dryer, screen, shafting, elevators, etc. Good salary, an all-year job and suitable living conditions. Address L. & L., care of Cement & Engineering News, 672 Transportation Bldg., Chicago.

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Experienced Cement Chemist wanted. Must be capable of acting as assistant manager. Address R-C. C., care of Cement & Engineering News, 672 Transportation Bldg., Chicago.


## USED MOTORS

**For immediate Delivery—Overhauled and Guaranteed—Largest Stock in America to Choose From. For Sale: 3 Phase, 60 Cycle, 220 V.**

| H.P. | | Speed |
|---|---|---|
| 1— 3 | —General Electric | 1800 |
| 1— 3 | —Westinghouse | 1200 |
| 1— 5 | —Wagner | 1800 |
| 1— 5 | —Allis Chalmers | 1200 |
| 1— 7½ | —General Electric | 1800 |
| 1—10 | —Westinghouse | 900 |
| 2—15 | —Westinghouse, Type CCL | 1750 |
| 2—15 | —Watson, slip-ring, var. speed | 1720 |
| 1—15 | —Fairbanks-Morse | 1200 |
| 1—15 | —General Electric, Form L | 1200 |
| 1—15 | —General Electric | 1200 |
| 3—15 | —Fairbanks-Morse, slip-ring, constant speed | 1200 |
| 1—15 | —Westinghouse, vertical | 1135 |
| 2—15 | —Allis-Chalmers | 1130 |
| 2—15 | —Allis-Chalmers | 860 |
| 2—15 | —Westinghouse | 850 |
| 4—20 | —Westinghouse | 1750 |
| 1—20 | —General Electric | 1200 |

Send for MONTHLY BARGAIN SHEET Showing Complete Stock and Net Prices.

GREGORY ELECTRIC CO.
16TH AND LINCOLN ST
CHICAGO, ILLINOIS

Capital and Surplus, $500,000.00


### WANTED

Quarry Foreman, Cement plant, Eastern Pennsylvania—Steam shovel operation. State fully experience, reference and salary. Answer to Box C. C. H., c/o Cement & Engineering News, 672 Transportation Bldg., Chicago, Ill.

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Wanted: Complete second-hand cement plant, machine shop and laboratory outfit; must be in first-class condition. Address R. C. C., care of Cement & Engineering News, 672 Transportation Bldg., Chicago.

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### NO. 8 GATES BALL MILL FOR SALE

This Ball Mill has never been used. Complete with feeder, charge of balls and driving pulley. Price $4,500.00 for immediate sale. Address Box 142, c/o Cement & Engineering News, 672 Transportation Bldg., Chicago, Ill.

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### WANTED

Wanted at Once—Operating superintendent for a large dry process Rock and Shale plant in the East. Must have mechanical and executive ability. State age, past experience, position in draft, references and salary expected in first letter. Box 69, c/o Cement & Engineering News, 672 Transportation Bldg., Chicago, Ill.


## COMPRESSORS

| | Price |
|---|---|
| 1—12x12 Laidlaw-Dunn Gordon, belt driven, capacity 300′ | $ 750 |
| 1—12x12x16 Ingersoll, straight line, steam driven, capacity about 300′ at 80 to 100 lb | 600 |
| 1—Sullivan, 2 stage air, simple steam, capacity 1800′ at 80 to 100 lb | 2,500 |
| 2—14x12 Bury Duplex, belt driven, capacity about 550′ at 60 to 80 lb., each | 1,000 |
| 1—14x16x10x16 Sullivan, 2 stage air, simple steam, capacity 600′ at 80 to 100 lb | 1,500 |
| 1—14x9x10 Bury, 2 stage, belt driven, capacity 350′ | 1,500 |
| 1—Ingersoll-Rand Imperial Type XB2, 500′ | 2,000 |
| 1—Sullivan 2 stage, belt driven, 1400′ good as new, f. o. b. St. Louis | 4,500 |

## CARS

| | |
|---|---|
| 20—4 yd. Western, 2 way, contractors, 36″ gauge, wooden bodies, each | $ 125 |
| 70—2½ yd. steel bodied, end dump quarry cars, 36″ gauge, each | 80 |
| 30—2½ yd. steel bodied, end dump quarry cars, 48″ gauge, each | 75 |
| 20—12 yd. Western, standard gauge MCB, air dump cars, almost new, each | 1,050 |
| 20—12 yd. Western, standard gauge MCB, air dump cars, good condition, each | 900 |
| 50—1½ yd. Koppel "V"-shaped, 24″ gauge, steel cars, new, each | 120 |

## CRUSHERS

| | |
|---|---|
| 1—No. 9 Style "K," almost new | $7,000 |
| 2—No. 5 Austins, one straight and one angle drive, both fine condition, each | 1,500 |
| 1—No. 6 Style "D" Gates, fine condition | 2,000 |
| 1—No. 7½ Austin, almost new | 2,500 |
| 1—10x20 Blake jaw crusher on skids | 800 |
| 1—9x16 Good Roads Machinery, jaw crusher on wheels, with 22′ elevator. | 800 |
| 1—9x16 Universal on skids, almost new. | 500 |
| 1—No. 7½ McCully | 3,000 |
| 1—No. 5 McCully | 1,500 |

## ELEVATOR AND SCREENS

| | |
|---|---|
| 1—No. 5 Gates 70′ centers, almost new. | $ 700 |
| 1—No. 7½ Austin 62′ centers, fine condition | 900 |
| 1—No. 9 with 36″ buckets, good condition, without belt | 900 |
| 1—Stephens & Adamson stone screen, 42″x16′, with dust jacket, practically new | 700 |
| 1—48x18 Austin screen with dust jacket | 800 |
| 1—48x20 McCully screen with dust jacket | 900 |

## CLAM SHELL BUCKETS

| | |
|---|---|
| 1—¾ yd. Owen with teeth, almost new | $450 |
| 1—1½ yd. Hayward, first class | 650 |
| 1—1 yd. Browning | 500 |
| 1—1½ yd. Page Dragline | 500 |

## CRANES

| | |
|---|---|
| 1—7 ton, 4 wheel Vulcan Bucyrus single line crane | $ 6,000 |
| 1—10-ton Browning 4 wheeled, with bucket | 7,000 |
| 1—15 ton Brown hoist, with 50′ boom, 8 wheeled MCB, with 2 yd. Brown hoist, clamshell | 17,500 |
| 1—20 ton Brown hoist, 8 wheel MCB, 50′ boom, and bucket | 18,000 |
| 1—25 ton Browning hoist, 8 wheel MCB, 50′ boom, and bucket | 21,000 |

## HOISTING ENGINE

| | |
|---|---|
| 1—6¼x10 American DCDD, with boiler. | $1,000 |
| 1—7x10 Lidgerwood DCDD, with boiler | 1,100 |
| 1—7x10 Lambert, 3 drum, with boiler | 1,600 |
| 1—8x12 Mundy DCDD, with boiler | 1,300 |
| 1—9x10 Lidgerwood, 3 drum, 32″ drums, without boiler | 1,900 |
| With boiler | 2,300 |
| 1—Clyde 9x10, 3 drum with boiler, f. o. b. Mich. | 2,500 |
| 1—5x8 DCDD Reversible O&S, with vertical engine, without boiler | 350 |
| With boiler | 550 |
| 1—7x10 Lambert DCDD, with boiler | 1,100 |

## LOCOMOTIVES

| | |
|---|---|
| 1—9x14 Vulcan, 36″ gauge, saddle tank. | $1,250 |
| 1—9x14 Vulcan 36″ gauge, saddle tank. | 1,350 |
| 1—10x16 Vulcan 36″ gauge, saddle tank. | 1,600 |
| 1—10x16 American 36″ gauge, saddle tank, good as new | 1,850 |
| 1—19x24 Baldwin, 10 wheeler, 60 tons. | 8,000 |
| 1—18x24 American, 10 wheeler | 5,000 |
| 1—17x24 6 wheel switcher | 5,000 |
| 1—14x24 Pittsburgh, saddle tank standard gauge with separate tender | 4,000 |

## DRAGLINES

| | |
|---|---|
| 1—Monighan-Walker steam machine, with 50′ boom, 1½ yd. bucket, almost new | $7,000 |
| 1—Flory outfit engine 10x12 heavy dragline type boiler, fire box 150 lb. pressure, boom 60′, steel bucket, 2 yd. New 1917 | 9,000 |
| 1—24 Bucyrus, with 85′ boom | |

## RAIL

| | |
|---|---|
| 400 tons—35 lb., with angle bars | $57 |
| 1500 tons—56 lb., with angle bars | 58 |
| 100 tons—75 lb., with angle bars | 55 |

## PUMPS

| | |
|---|---|
| 1—10″ Morris, sand, belt drive | $ 500 |
| 1—8″ Morris, water, belt drive | 300 |
| 1—20x10x14 Worthington duplex | 600 |
| 1—Wilson-Snyder water works pump, complete with condenser | 2,000 |

## STEAM SHOVELS

| | |
|---|---|
| 1—No. 0 Thew on standard gauge railroad truck, ⅝ yd. dipper | $2,500 |
| 1—No. 0 Thew traction with ⅝ yd. dipper, fine condition | 4,000 |
| 1—14B Bucyrus traction with ⅝ yd. dipper, almost new | 4,000 |
| 1—18B Osgood traction with ¾ yd. dipper, high boom, one year old | 5,000 |
| 1—No. 1 Vulcan revolving shovel, standard gauge with ¾ yd. dipper, good as new | 4,500 |
| Same as above, with 35′ crane boom | 5,500 |
| 1—45 ton Bucyrus, standard gauge, 1¾ yd. dipper | 6,500 |
| 1—Model 60 Marion with 2½ yd. dipper | 7,000 |
| 1—65 ton Bucyrus with 2½-yd. dipper | 5,000 |

## CABLEWAYS

| | |
|---|---|
| 1—9x10 Lidgerwood, 3 drum engine and boiler and carriage and part of other fittings, no rope | $3,000 |
| 1—50 hp. Flory DD electric with carriage and fittings, but no rope | 3,000 |
| 1—7x10 Flory steam DCDD with boiler, carriage and all fittings, but no rope | 1,950 |

## BOILERS

| | |
|---|---|
| 1—25 hp. vertical American hoist and derrick | $250 |
| 1—40 hp. firebox on steel truck | 550 |
| 1—50 hp. vertical butt strap | 750 |
| 1—60 hp. vertical Lidgerwood | 800 |

## MOTORS

| | |
|---|---|
| 1—20 hp. Westinghouse, 60 cycle, 3 phase, 220 volt | $400 |
| 1—30 hp. Westinghouse, 60 cycle 3 phase, 2200 volt | 450 |
| 1—35 hp. Westinghouse, 60 cycle 3 phase, 2200 volt | 500 |
| 1—50 hp. General Electric, 60 cycle 3 phase, 220 volt | 750 |

## MACHINERY WAREHOUSE & SALES COMPANY,

*Successor to* GEO. C. MARSH & Co.

**Tel. Harrison 5799**

**750 Old Colony Bldg., Chicago**

# Complete Road Builders' Outfit For Sale

1—**20 hp. Reeves Engine.**
2—**Western Elevating Graders.**
25—**Western 1½ yd. Dump Wagons.**
2—**No. 16 Koehring Concrete Mixer,** steam driven, traction, paving type, with boom and bucket.
1—**½ yd. Austin Cube Concrete Mixers,** steam driven, traction, paving type, with boom, bucket.
1—**5 ft. Fairbanks,** gas driven, low charging, **Concrete Mixer.**
**7992 lin. ft. Heltzel Pat. Steel Forms,** 6 in. high.
**56 doz. Heltzel Pat. Hanging.**
2—**New Economy Sack Balers.**
1—**Warehouse Truck,** 2 wheeled.
1—**Warehouse Truck, Fairbanks.**
2—**Concrete Paving Rollers,** 10 ft.
2—**Any weight Hand Rollers,** Max. wt. 300 lb.
2—**Gravity Brick Conveyors.**
2—**O. K. Harry Steel Water Tanks,** 6 ft. x 8 ft.
1—**O. K. Harry Steel Water Tank,** 4 ft. 6 in. x. 3 ft.
1—**O. K. Harry Water Wagon and Pump.**
1—**Diaphragm Pump.**
1—**No. 3 C. H. & E. Piston Force Pumps,** 2½ in. disch.
1—**Fairbanks 2 hp. Triplex,** 1 in. disch. **Pump.**
**Water Pipe with sleeves.**
1—**5-ton Kelly Springfield,** steam power **tandem roller.**
1—**No. 684 Western Graders,** 8 ft. blade.
1—**Little Western Grader,** 6 ft. blade.
8—**Western 2 wheeled Scrapers.**
4—**Maywood (Mormon) Scrapers.**
3—**No. 2 Drags, Westerns.**
6—**No. 3 Drags, Westerns.**
3—**No. 2 Michigan Scrapers.**
1—**4 Horse Western Plow.**
1—**2 Horse Western Plow.**
1—**24 in. Disc.**
1—**2 Horse Steel Jno. Deere Plow.**
2—**Western Rooters, No. 20.**
1—**Western Rooter, Giant.**
43—**Western Dump Cars,** steel frame, 24 ga., 1½ yd.
14—**Western Dump Cars,** wood frame, 24 ga., 1½ yd.
3—**Brick Wagons.**
3—**Sterling Trucks,** 2½ ton, Steel Dump Bodies, Wood Hoist, 2 months' use.
3—**Frogs, Switch Points and Throws,** 20-lb. rail.
1—**Track Tools.**
2—**Sheets Steel, 7 Steel Ties with Bolts, 4 Axles and Wheels,** for jumping crossing.
1—**Johnson Car Replacers.**
1—**Automatic Trip Jack.**
4—**Western Portable Telescoping Bins,** 20-yd. cap.
1—**Owen Clamshell Bucket,** ¾ yd.

The above equipment is located in Illinois, and at Granite City, Illinois, and St. Louis, Mo.
Prices Quoted are F. O. B. Cars at point of shipment.
Terms: Sight draft attached to bill of lading or terms on approved credit.
The equipment is in first-class working condition for used outfits, and is subject to inspection at point of shipment.
The equipment is offered subject to prior sale.

## Granite City Lime & Cement Company

**20th and A Streets, Granite City, Illinois**


# BUYERS' DIRECTORY OF MANUFACTURERS OF MACHINERY, EQUIPMENT AND SUPPLIES

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Allis-Chalmers Mfg. Co.
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Williams Pat. Crusher & Pulv. Co.

### Chemical Apparatus
Henry Heil Chemical Co.

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A. Plamondon Mfg. Co.

### Concrete Block Machinery
W. E. Dunn Mfg. Co.
Republic Iron Works.

### Concrete Mixers
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C. Austin Co.
W. E. Dunn Mfg. Co.
Jaeger Machine Co.
Kent Machine Co.
Northwestern Steel & Iron Co.
Republic Iron Works.

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H. W. Caldwell & Son Co.
B. F. Gump Co.
Jeffrey Mfg. Co.
Link-Belt Co.

### Cranes, Locomotive
Link-Belt Co.

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Austin Mfg. Co.
Chalmers & Williams, Inc.
The Jeffrey Mfg. Co.
Traylor Eng. & Mfg. Co.
Universal Crusher Co.

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Sasgen Derrick Co.

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### Dust Collectors
Allis-Chalmers Mfg. Co.
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Ideal Engine Co.

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The Jeffrey Mfg. Co.
Daniel B. Luten.
Richard K. Meade.
F. L. Smidth & Co.
Soper Engineering Co.

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Sauerman Bros.

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Wm. B. Scaife & Sons Co.

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Automatic Sealing Vault Co.

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Ganschow Co., Wm.
A. Plamondon Mfg. Co.
Stroh Steel Hardening Process Co.

### Hoists (Builders)
Ideal Engine Co.
American Cement Machine Co.

### Kilns
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Traylor Eng. & Mfg. Co.
Vulcan Iron Works.

### Loaders and Unloaders
Jeffrey Mfg. Co.
Link-Belt Co.

### Locomotives (Electric)
Jeffrey Mfg. Co.

### Marble (Crushed)
Middlebury Marble Co.

### Motors (Electric)
Westinghouse Electric & Mfg. Co.

### Motor Trucks
Acme Motor Truck Co.
Pierce-Arrow Co.
Standard Motor Truck Co.
White Co.

### Oil Engines
Power Mfg. Co.

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W. E. Dunn Mfg. Co.
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The Improved Jeffrey Pivoted Bucket Carrier solves the labor problem of handling Coal and Ashes in power plants. Send for New Bulletin No. 237D.

The Jeffrey Self-Propelling Loader saves 5 to 10 men in handling loose materials from ground storage.

## Every Succeeding Draft
### on the Man Power of the Country

Emphasizes more forcibly the need of mechanical equipment for handling materials. Yours is a problem of how to accomplish more with less help.

# JEFFREY
## LABOR—SAVING
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Has released hundreds of men for military service and increased output and lowered handling costs in practically every industry.

Only a few of our many standard types of Elevators and Conveyors are illustrated here. Complete Bulletins and Catalogs showing our entire line will be gladly sent to users for the asking.

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## The Jeffrey Manufacturing Co.
### COLUMBUS, OHIO

BRANCH OFFICES:

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The Jeffrey Belt Conveyor is unquestionably without a peer for the quick, silent and economical handling of nearly all loose materials.

A Jeffrey Continuous Bucket Elevator handling Crushed blast furnace slag.
Write for New Bucket Elevator Catalog No. 244-C.

# CEMENT AND ENGINEERING NEWS

with which Gravel & Stone Magazine is incorporated

(PUBLISHED MONTHLY)

William Seafert, *Publisher*
J. F. Waldron, *Editor and General Manager*
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Advertising copy or changes in ads. must be in this office by the 25th of each month, as hereafter our magazine will appear on the 5th of the following month

Advertising Rates Sent on Application

Vol. 30 CHICAGO, NOVEMBER, 1918 No. 11



TRADE SAWYER MARK Registered

THE OLD RELIABLE

STITCHED CANVAS BELTING

gives the best service in the cement plant. It has the endorsement that experienced manufacturers have placed upon it.

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United States Rubber Co.

*Mechanical Goods Division*
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Let Us Set You Up In Business

SELLING SILOS

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are ousting all others, because "Caldwell" Agents can give the Farmer *more for less money.*

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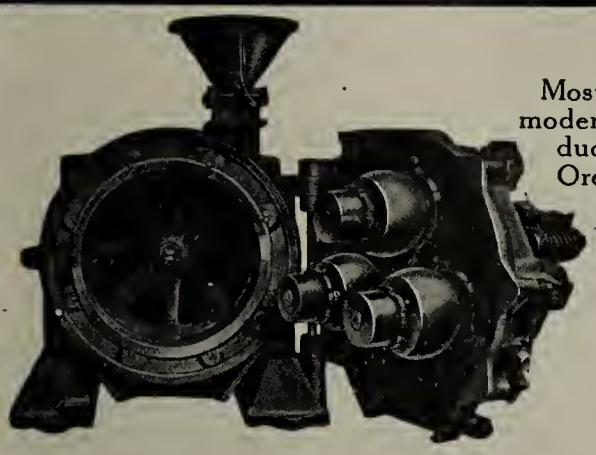

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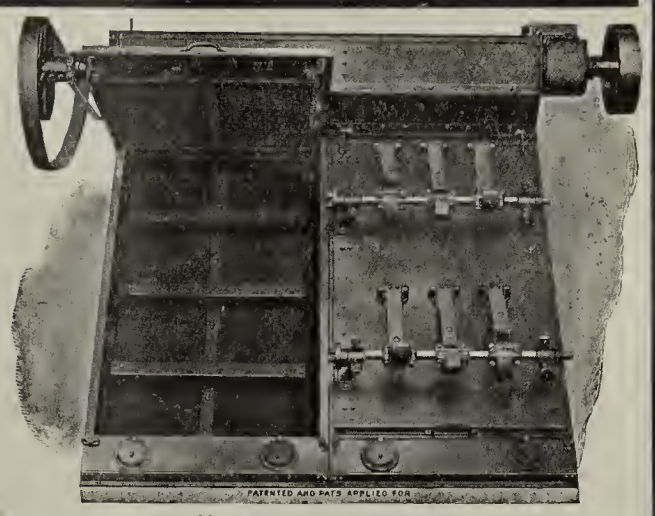


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The greatest producers known on Limestone, Lime, Shells, Chemicals, Talc, Clay, Chalk, Bark, Rosin, Sulphur, Coal, Salt, and many other moderately hard and soft materials. High Speed Pulverizers, crushing by a series of blows delivered at high speed against the material fed into the machine.

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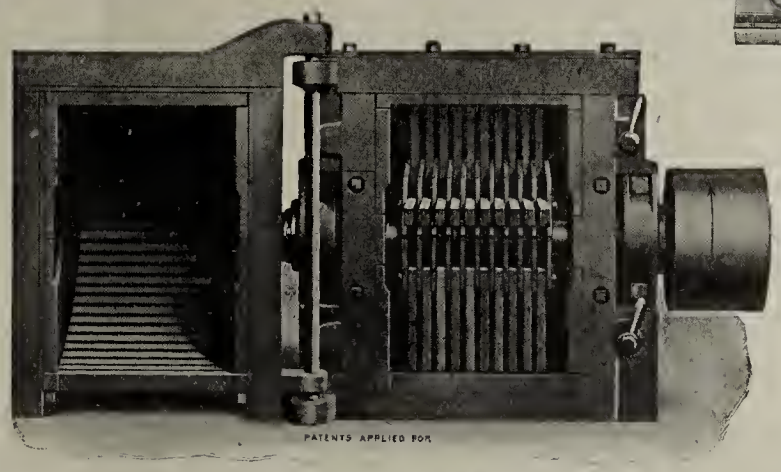


Swing-Sledge Mill

WE MAKE THE

## LARGEST COMPLETE

LINE OF

CRUSHING, GRINDING, SCREENING, WEIGHING, SACKING, ELEVATING AND MIXING MACHINERY

## IN THE WORLD

**Send for Condensed Circular No. 60**

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## Henry Heil Chemical Company

**210 to 214 South Fourth Street, ST. LOUIS, MO.**

We make a specialty of supplying cement works with

**Chemical Apparatus, Chemicals and Reagents**

Gilmore's Needles, Cement Moulds, Vicat Apparatus, Schumann's, LeChatelier's and Jackson's Specific Gravity Apparatus, Etc.

**Pyrometers, Calorimeters**

**High Grade Goods Only**

*Satisfaction Guaranteed*

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The only way for a concrete contractor to be thankful is to give up trying to make a living at "odd jobs" and build for himself a really **big** business. The demand for monolithic concrete grain storage, water towers, coal pockets and silos is big and growing. A single POLK SYSTEM machine equips you for all kinds of circular concrete work. Get ready **now** to be thankful **next year.** Write today.

## Polk Genung Polk Company

**706 Fisher Bldg.** **CHICAGO**

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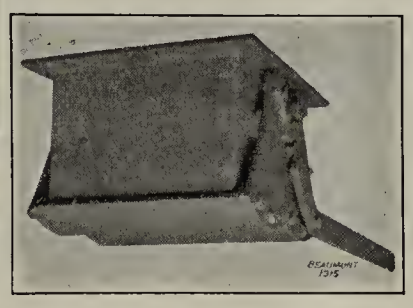
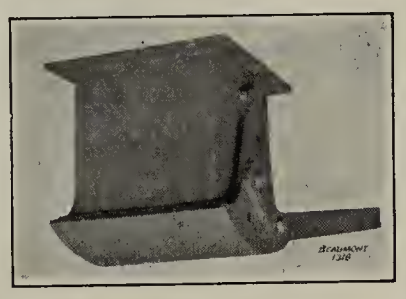


DUPLEX GATE



SIMPLEX GATE

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**These Gates are made of best quality cast iron, of excellent workmanship. They are usually fitted with hand ever, but can be furnished with any type of control demanded by the conditions.**

***Write for Catalog No. 37 showing full line of Beaumont Gates.***

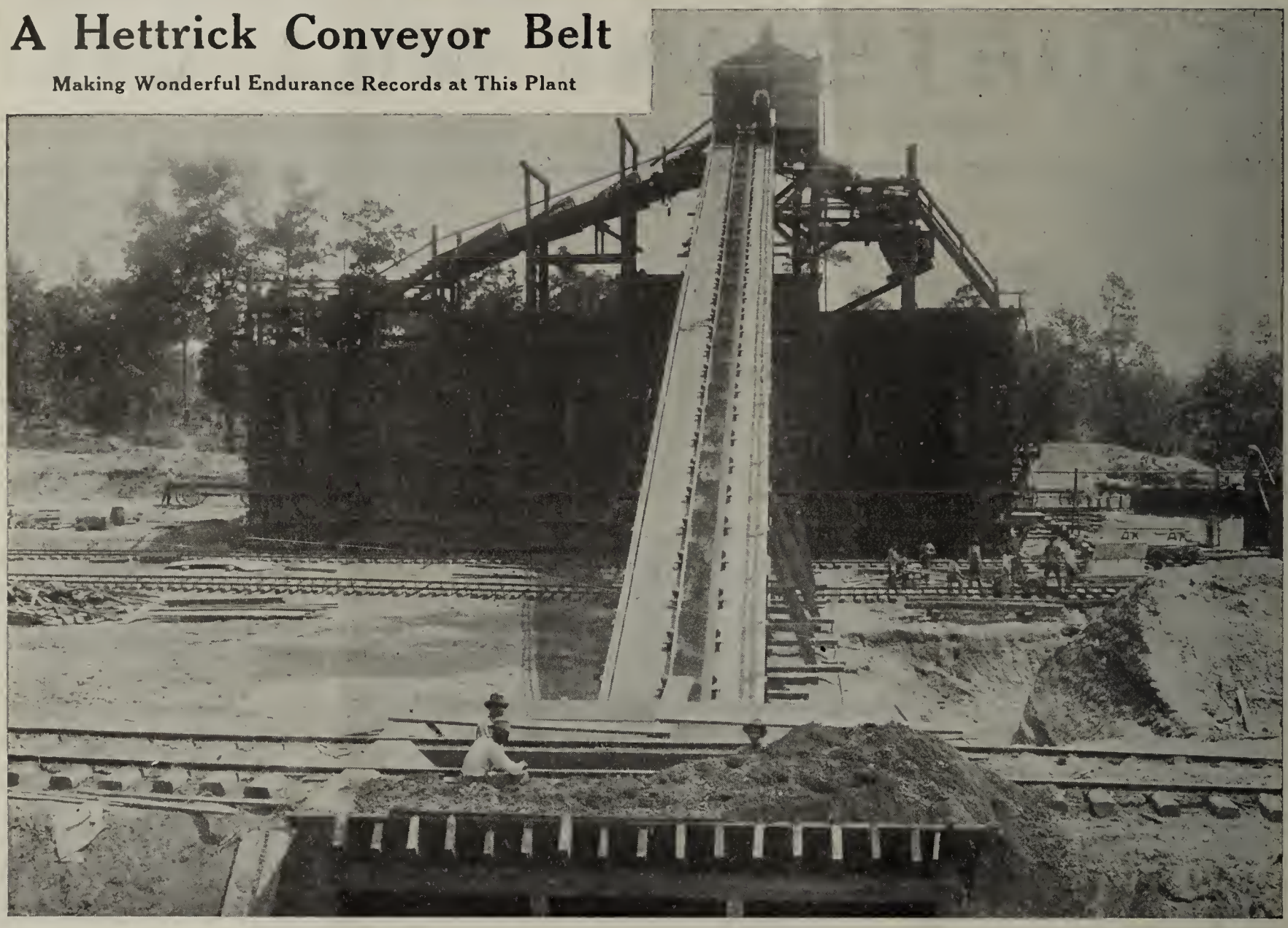
## BEAUMONT MFG. CO.

**340 Arch St., Philadelphia, Pa.**

**New York: 50 Church St.** **Boston: 141 Milk St.**

# A Hettrick Conveyor Belt

**Making Wonderful Endurance Records at This Plant**



***"Has given us better satisfaction than any other belt we have ever used"***

writes J. L. Thomas, Superintendent, Tioga Gravel Co., Alexandria, La., whose plant is illustrated above.

The success of Hettrick Red Stitched Canvas Conveyor Belting is a plain case of "survival of the fittest." When mills similar to yours come back repeatedly with orders covering their conveyor belt requirements—what stronger evidence of merit can you ask?

The rains of spring, the heat of summer, the droughts of autumn the cold of winter, may do their utmost, but Hettrick continues on the even tenor of its way, doing its work faithfully and well, be it outdoors or indoors.

As a piece of workmanship it is the perfection of cotton weaving. As a transmitter of power it is unsurpassed. As a conveyor it is unequalled.

We would like to send cement and lime manufacturers and gravel, sand and crushed stone producers a sample and folder that tells the whole story of Hettrick Conveyor Belting.

## The Hettrick Mfg. Co.

TOLEDO, OHIO

# BLACK GIANT STITCHED DOUBLE BELTING

THIRTY thousand feet of BLACK GIANT DOUBLE STITCHED BELTING in sizes ten to twenty-four inch eight ply furnished within the last sixty days to two of the largest cement plants in the United States. Both of these plants have used BLACK GIANT DOUBLE STITCHED BELTING for the past five years. BLACK GIANT DOUBLE STITCHED BELTING is the most improved cotton belting manufactured today and is adapted for all kinds of work wherever machinery is run, either for transmission of power, elevators or conveyors.

*Manufactured exclusively by*

**McIlroy Belting and Hose Co.**

**Hammond, Indiana, U. S. A.**

**2-Yard Clam Shell Bucket**

**McMyler-Interstate Class "M" Two line; weighs about 4600 lbs.**

**Condition Like New—Used But Thirty Days**

**$775.00 f.o.b. Chester, Pa.**

**Inquiries are solicited for Steam Shovels, Locomotives, Cars, Rails, Hoists, Derricks, Etc.**

**Wm. B. Grimshaw Co.**

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**Dealers in "Used" but not "Abused" Machinery**

15/16 IN. HY-RIB (SEVEN-RIB). Ribs 15/16 in. high, 4 in. apart; sheets 24 in. wide.

# Insure Your Building Results

by using the complete line of material for use in all types of construction. Be sure of prompt delivery, as our complete stocks and large organization warrant immediate shipment.

# HY-RIB and RIB LATH

the acknowledged standard material, as used everywhere in all kinds of construction work.

The many depths, gauges and types of Hy-Rib adapt it to reinforcement of concrete floors and roofs. It is an ideal plastering surface for walls and ceilings and renders the building entirely fireproof. Easily put in place and on arched and curved work it is furnished bent to the exact curve.

Our complete line includes, in addition to the above, Diamond Lath in two types; Pressed Steel Channels and Studs of all varieties; four types of Corner Beads; three types of Base Screeds, etc. Send for free Hy-Rib Hand Book.

**TRUSCON STEEL COMPANY, Youngstown, Ohio**

***Representatives in Principal Cities***

**For Concrete Roads**

Kahn Road Mesh
The most efficient reinforcement for concrete roads and pavements.

Kahn Curb Bars
Protect and reinforce concrete curbs.

Kahn Armor Plates
Perfectly protect expansion joints.

Write for Highway Pamphlet and estimates.

# AJAX CONVEYOR BELTING

IN the Ajax Brand Rubber Conveyor Belting we offer a first class belt for ordinary conveying purposes. The duck and rubber is of good quality and will compare favorably with the good belts now on the market. We make it with a flat or convex surface, and with a cover varying in thickness from one-sixteenth inch to one-fourth inch. For conveying coal, sand, gravel, stone, etc.

Advise us regarding your installations. We make belts for every purpose.

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| *Conveyor Belts* | *Transmission Belts* | *Packing* |
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**The Gutta Percha & Rubber Mfg. Co.**

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# DUXBAK "Performs" For the Engineer!

*EVERY Duxbak Waterproof Leather Belt bought through the recommendation of engineers or superintendents always gives a good account of itself—its performance proves it to be worthy of anyone's confidence.*

TRY A DUXBAK AND SEE HOW GOOD IT WILL MAKE YOU FEEL

DUXBAK BELTING TRADE MARK Reg. U. S. Pat. Off.

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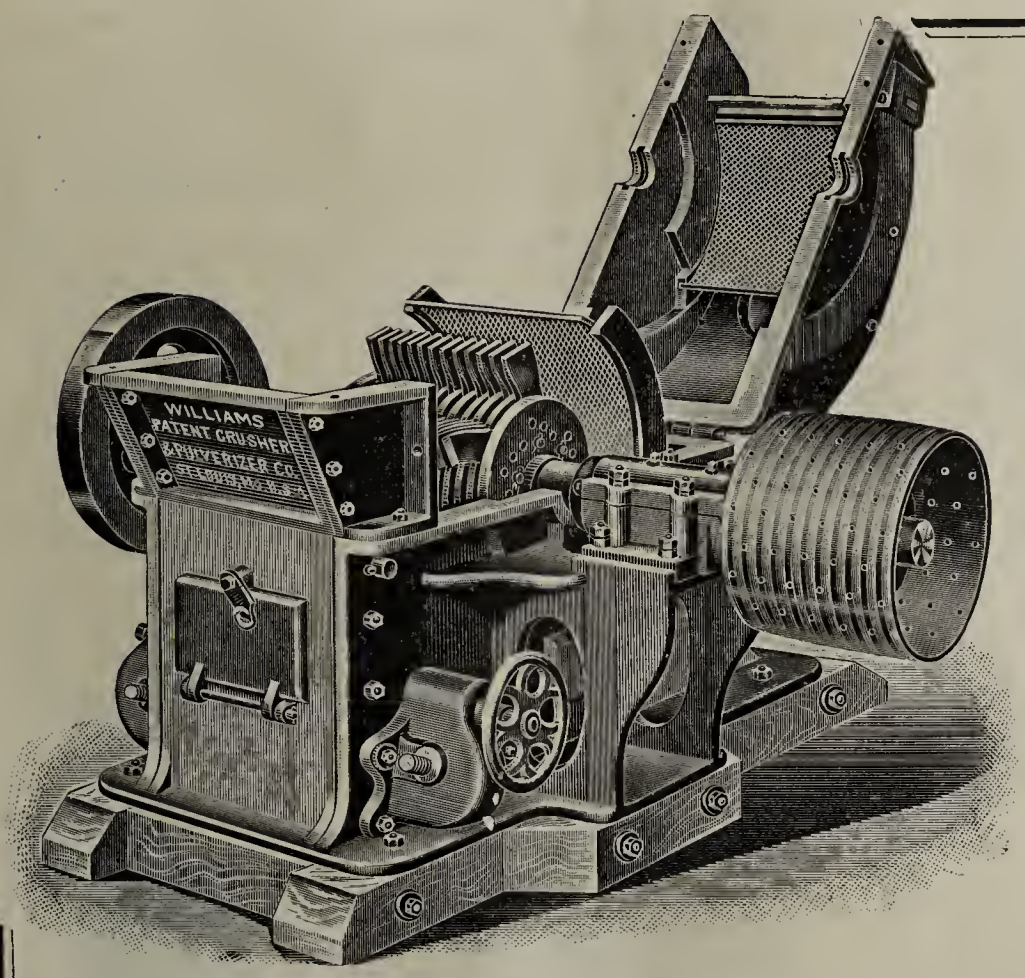


# WILLIAMS
# LIMESTONE GRINDERS

**Take 2 in. to 3 in. dry stone and in one operation, without outside screens or separators will produce 95% through 20-mesh material.**

**CAPACITIES RANGE FROM ¼ TO 30 TONS PER HOUR**

**Over 5,000 Williams Mills in Daily Operation.**

There is undoubtedly room in your plant for one of these machines, which, in the last twenty-two years have proven that they are money savers, can be depended on, and really have merit. If further information is desired, Write for Bulletin No. 17, which is brim full.

**THE WILLIAMS PATENT CRUSHER & PULVERIZER COMPANY**

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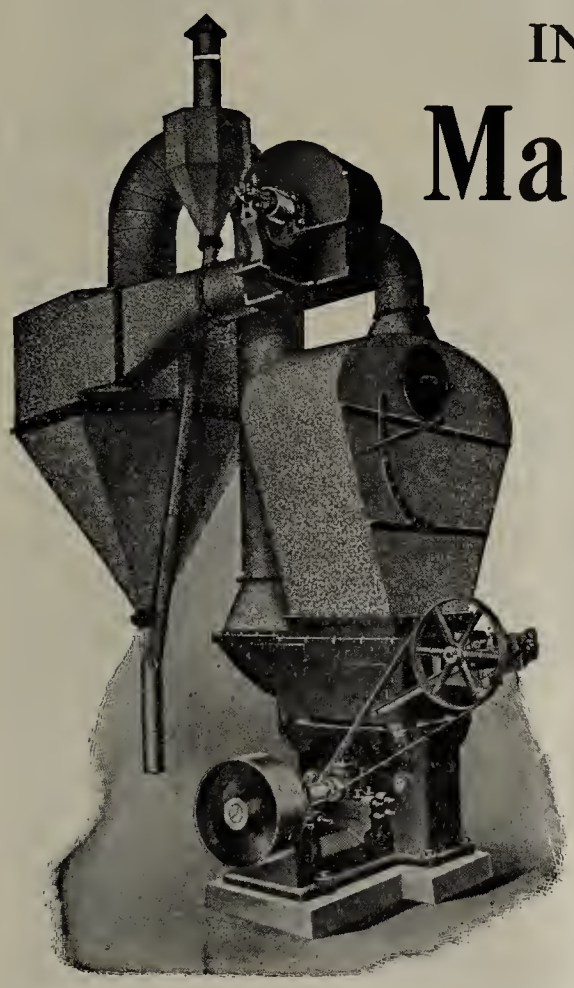
**SAN FRANCISCO**

# Complete Grinding IN ONE Machine



**In successful use grinding Cement, Clinker, Limestone, Coal**

**INSTANT REGULATION OF FINENESS**

**NO DUST**

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**THE BONNOT CO.**
**CANTON, OHIO**

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**A superior, colorless, Liquid Cement Hardener**

**GRANOLITHIC** makes cement floors Wear Proof—Dust Proof and Water Proof. The dust that is so injurious to merchandise, machine bearings and motors is eliminated. The cost of treating cement with **GRANOLITHIC** is trifling compared to the economies effected.

Unsolicited testimonials tell the story. Write for full particulars today.

**GRANOLITHIC COMPANY, Inc.**
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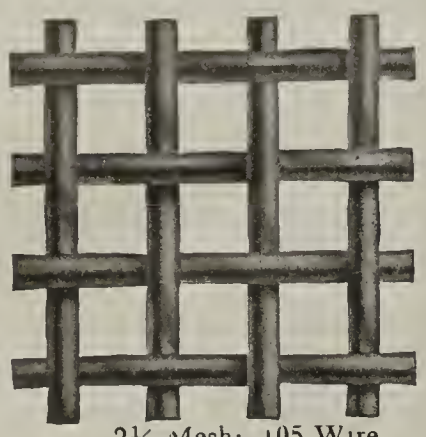
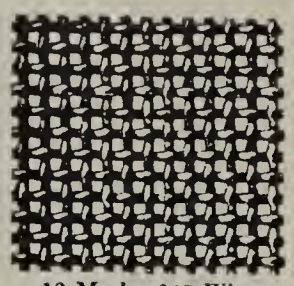
**Midway**

**LIQUID CEMENT FLOOR HARDENER**

## Cleveland Double-Crimped
# WIRE CLOTH



2½ Mesh; .105 Wire



1½ Mesh; .047 Wire

Renowned for its Uniformity, its Superior weave, its Durability. Especially adapted for SAND, GRAVEL and CEMENT Screens. A large stock of the various meshes always on hand.

***Price Right—Catalog on Request***

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**3575-83 E. 78th Street, CLEVELAND, OHIO**

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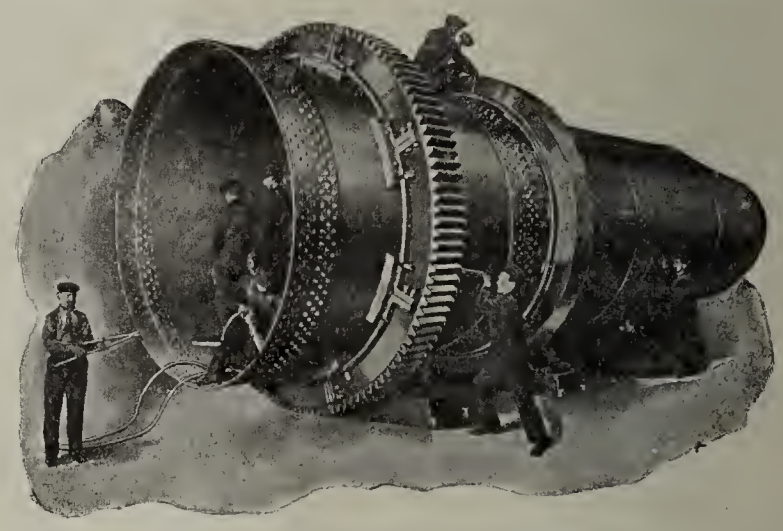
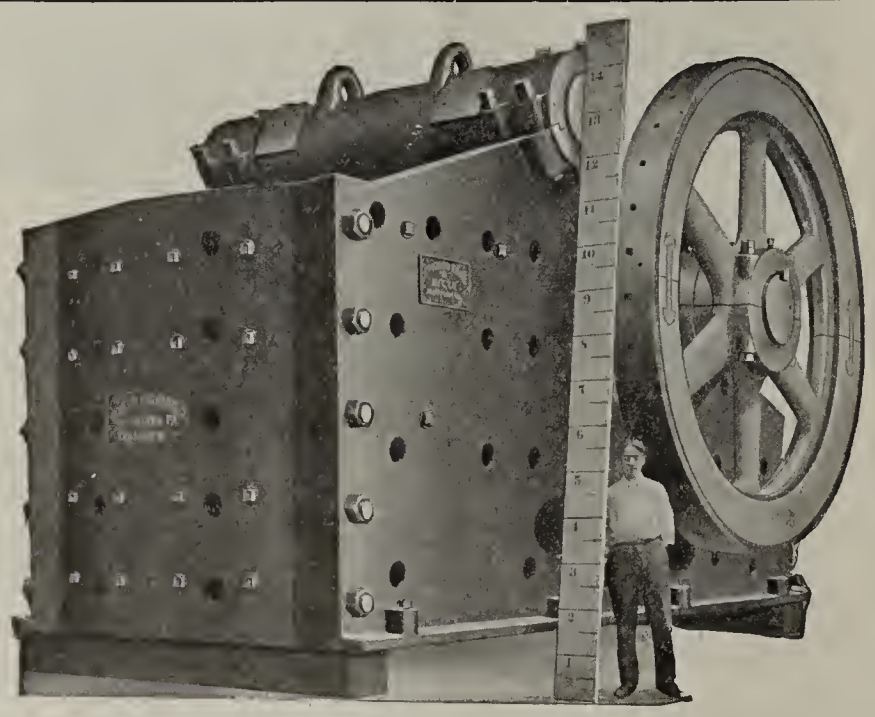
## The Most Widely Used Kiln in America

That's because maximum production and quality are assured wherever "Vulcans" are installed. Hundreds of plants have used Vulcan for years—and when re-ordering have, almost without exception, specified "Vulcans."
The reason is found in the painstaking care with which Vulcan Engineers study each customer's specific needs.
Our engineers are ready and willing to advise and assist you. Vulcan manufacturing facilities and skilled workmen are at your command.
If you use kilns, or can use kilns, you need "Vulcans." Write for kiln booklet today.

## Vulcan Iron Works
**1740 Main St., Wilkes-Barre, Penna.**





Traylor 60"x86" All Steel Jaw Crusher

## TRAYLOR JAW CRUSHERS
**Are Built in All Sizes from 7″x10″ to 66″x86″**

The 66"x86" is the largest crusher built.
All Traylor Jaw Crushers have cast steel water cooled pitmans.
Extra size pitman and swing jaw shafts of finest hammered steel.
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Manganese steel or chilled iron jaw plates.

# TRAYLOR BUILT
## MACHINERY
**A CRUSHER FOR EVERY PURPOSE**

***We Make***

In addition to **JAW CRUSHERS** illustrated

**The Traylor Gyratory Crusher**
The last word in Gyratorys.

**The Traylor Crushing Rolls**
They eliminate the personal equation in automatically preventing tire corrugations.

**The Traylor Tube Mills**
Long or short for wet or dry grinding. Have water cooled bearings of extra size. Positive automatic feed that assures maximum tonnage for minimum horse power.

**The Traylor Ball Tube Mill**
For reducing lumps to fines in one step.

## "THE ULTIMATE CRUSHING EQUIPMENT"

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MAIN OFFICE AND WORKS: ALLENTOWN, PA., U. S. A.
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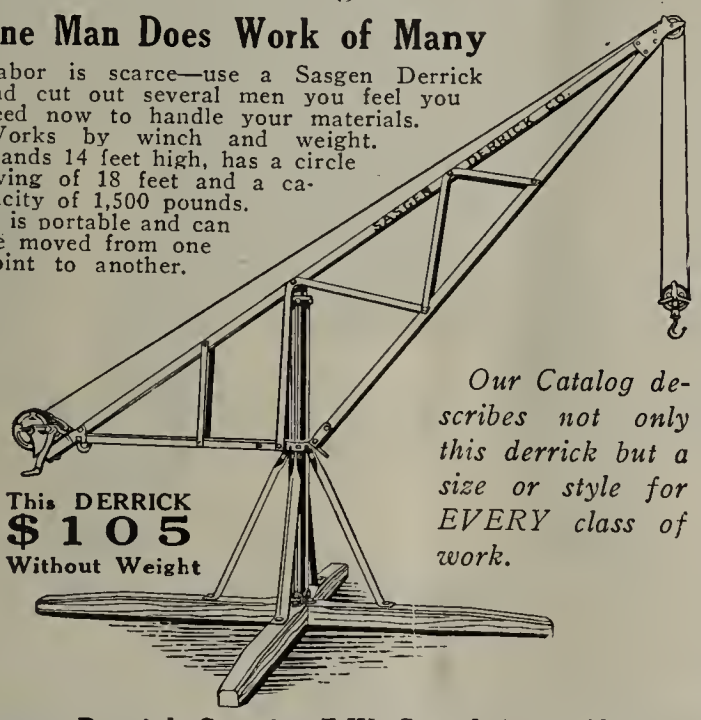
## With a Sasgen Portable Derrick

The Sasgen Circle Swing Counterweight Derrick cuts costs, labor and time loading or unloading material from cars or wagons.

### One Man Does Work of Many

Labor is scarce—use a Sasgen Derrick and cut out several men you feel you need now to handle your materials. Works by winch and weight. Stands 14 feet high, has a circle swing of 18 feet and a capacity of 1,500 pounds. It is portable and can be moved from one point to another.




This DERRICK
**$105**
Without Weight

*Our Catalog describes not only this derrick but a size or style for EVERY class of work.*

**Sasgen Derrick Co., 3117 W. Grand Ave., Chicago**

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Pavers, Grouters, Hoists, Pumps,

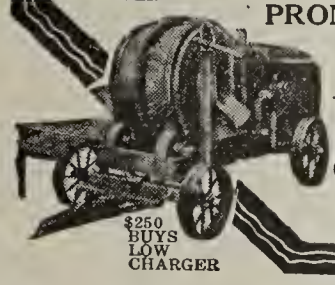
**BOSS** HIGH SPEED

Building Mixers, Backfillers, Elevators

## Contractors' Equipment

BUILT OF STEEL WITH HYATT ROLLER BEARINGS

ASK ABOUT OUR HIGH DRUM TWO BAG PAVER



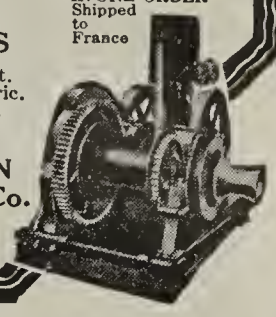
$250 BUYS LOW CHARGER

Astonishingly Low Prices
--Cash or Terms--
PROMPT DELIVERIES

All sizes from 5 ft. to 22 ft. cap., Gas, Steam or Electric. Complete stock carried in or near your city.

THE AMERICAN Cement Machine Co. Inc.
Keokuk, Iowa

OVER 100 SOLD IN ONE ORDER Shipped to France



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CALDWELL'S HELICOID

HELICOID Screw Conveyor is heavier, stronger and better made than any other. Requires fewer repairs—no lapped and riveted joints to come apart—flight all one piece. Special hangers, bearings and boxes for cement work. If you have anything to do with the manufacture of cement, you should write for our Catalogue.

Elevating, Conveying and Power Transmitting Machinery.

## H. W. CALDWELL & SON CO.

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DALLAS, TEXAS, 711 Main St.

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Half Bag Archer Mixer Delivering Direct Into Forms on Sewer Conduit Work

## Archer Mixers Are Proven Leaders

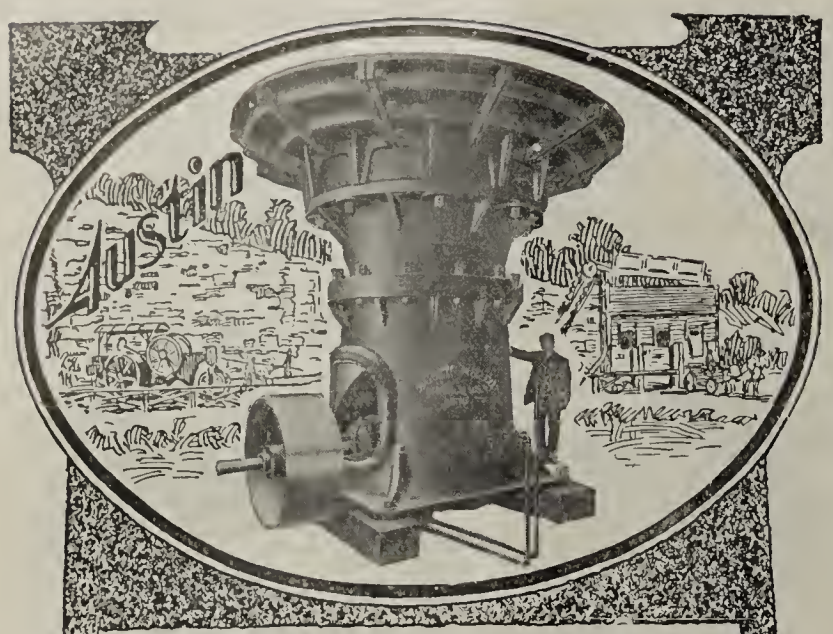
Do you want a mixer that will save you time on every job—a mixer that will enable you to get more work done with a smaller gang? Do you want a mixer that will save you so much that your extra profits will more than pay for the machine on your next job—or that will enable you to get more work by figuring lower? Then you must get the ARCHER—the original end discharge mixer.

Residences and farm buildings will constitute the majority of work next year. In this field the "half bag" ARCHER is, without question, unequalled.

**Let the ARCHER, Itself, Show You by Its Work How Much Better it is for You in Every Way. Write for "SHOW ME" Offer**

## Archer Iron Works,

2514 W. 34th Place, Chicago




## AUSTIN ROCK CRUSHERS ARE PROFIT PRODUCERS

There is a constantly increasing demand for rock products. It will continue after the war, when building of all kinds—everywhere—will be conducted on an unparalleled scale.

Austin Crusher-equipped quarry operators are prepared to get their share of this business. Austins deliver large outputs at minimum cost.

Made in 8 sizes—50 to 5,000 tons per day—Stationary and Portable types.

Write for information on Austin rock-crushing and road-building equipment.

**AUSTIN MANUFACTURING CO.**
CHICAGO

ALLIED — Sales for FRANCE, SPAIN, ITALY, PORTUGAL, BELGIUM and their Colonies, THE WEST INDIES and CHINA handled by ALLIED CONSTRUCTION MACHINERY CORPORATION, 120 Broadway, New York, U.S.A. — ALLIED



## CRUSH YOUR STONE and GRAVEL

The Ideal Crusher for the Concrete Product Plants, Gravel and Crushed Stone Producer

The World's Famous Universal Crusher

***We Build Crushers from 5 Tons to 300 Tons per 10-hour Capacity***

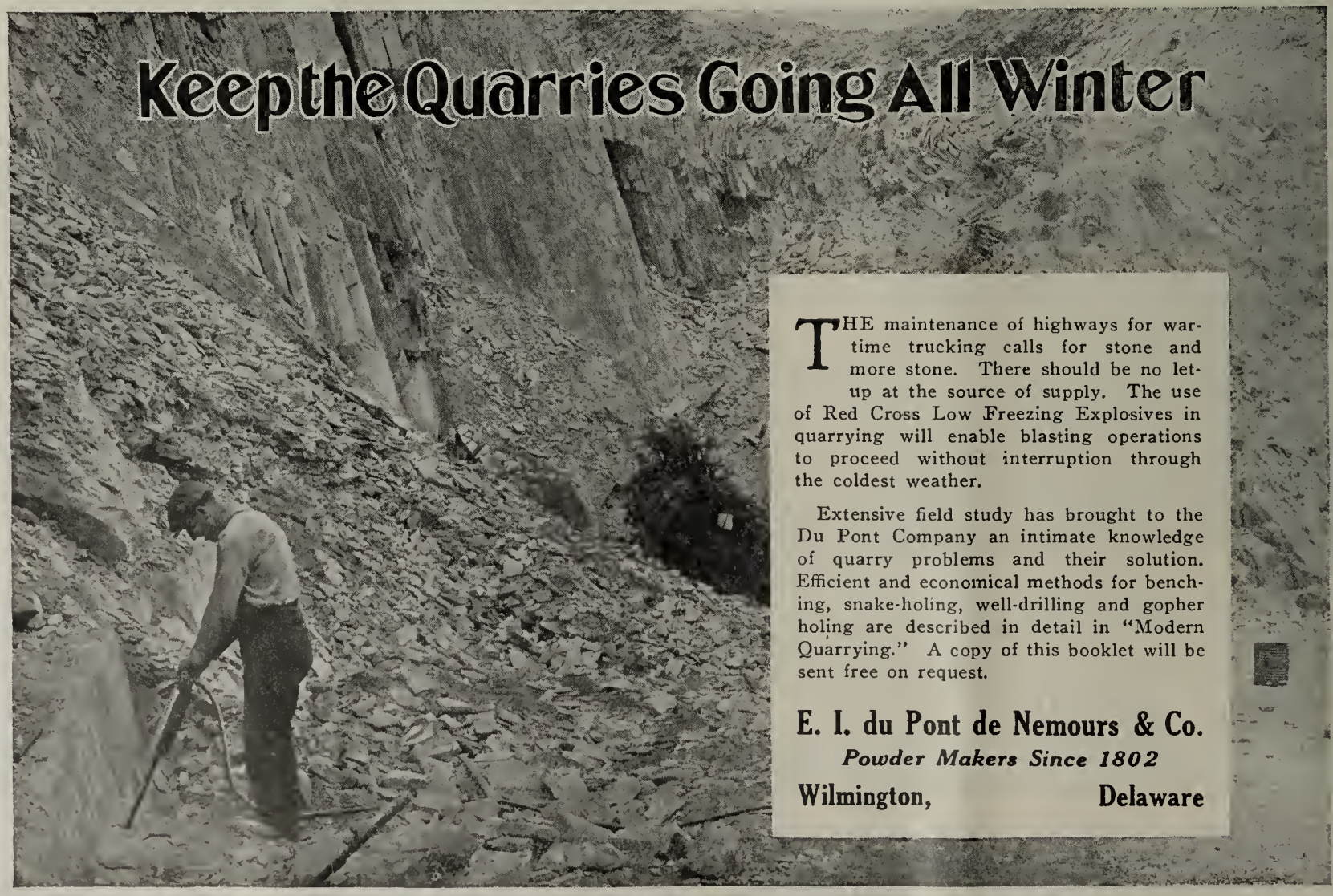
Instantly adjusted to produce size required from ¼ inch to 3 inches. *Write for Folder No. 14.*

**UNIVERSAL CRUSHER COMPANY**

230 Bee Ave — Cedar Rapids, Iowa, U. S. A.



DU PONT AMERICAN INDUSTRIES



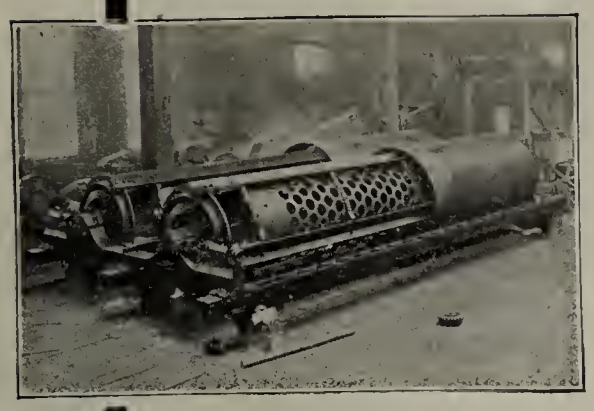

THE maintenance of highways for wartime trucking calls for stone and more stone. There should be no letup at the source of supply. The use of Red Cross Low Freezing Explosives in quarrying will enable blasting operations to proceed without interruption through the coldest weather.

Extensive field study has brought to the Du Pont Company an intimate knowledge of quarry problems and their solution. Efficient and economical methods for benching, snake-holing, well-drilling and gopher holing are described in detail in "Modern Quarrying." A copy of this booklet will be sent free on request.

**E. I. du Pont de Nemours & Co.**
***Powder Makers Since 1802***
**Wilmington, Delaware**

DU PONT

# Gates "Iron Frame" Revolving Screen



**Are Unequalled for**

**Durability, Simplicity, and Efficiency**

THE SCREEN FOR LARGE CAPACITIES AND CLEAN SEPARATION

WRITE FOR INFORMATION ON OUR COMPLETE LINE OF

**GYRATORY CRUSHERS, CRUSHING ROLLS ELEVATORS, HOISTS, SKIPS, ETC.**

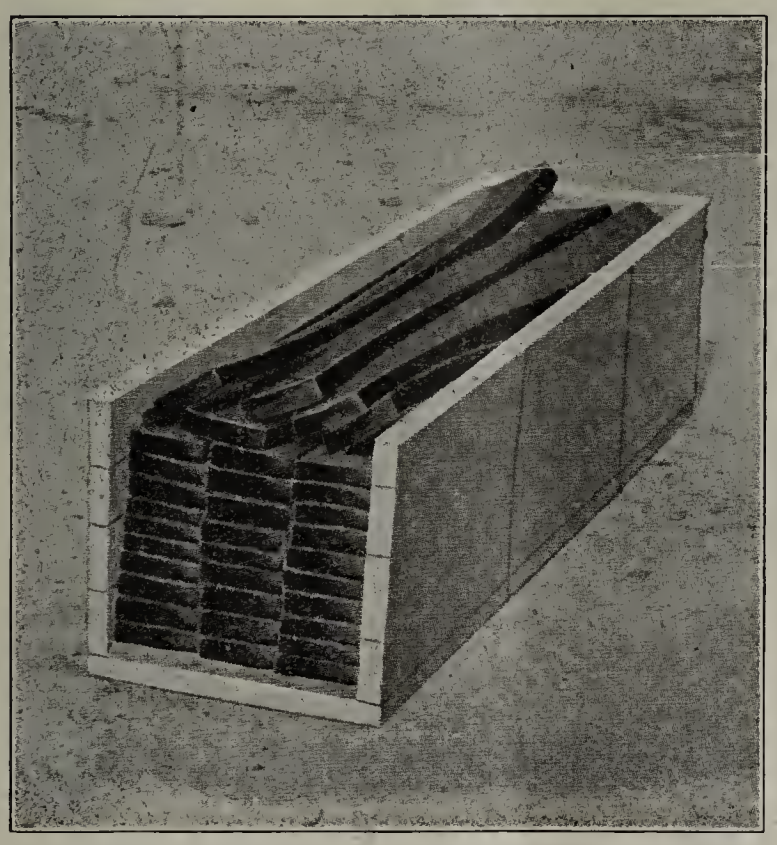
**Allis-Chalmers Manufacturing Company**

MILWAUKEE, WISCONSIN

Offices in Al Principal Cities

# ALLIS-CHALMERS

# Genasco Expansion Joints



have all the advantages of other prepared joints for concrete, wood-block, brick and granite-block pavements—**economy, ease of installation, the avoiding of melting and pouring**—and besides this

## Are All Asphalt

The **entire thickness** of a Genasco joint serves the purposes of expansion and contraction. Ready-made joints that contain felt or some other form of re-enforcement cannot do the work of the Genasco all-asphalt joint. Any thickness or depth.

The best way to judge this joint is to see it. A life-sized sample will be sent to any one interested. Write for it today.

**THE BARBER ASPHALT PAVING COMPANY**

**Philadelphia, Penna.**

# The Bradley Hercules Mill

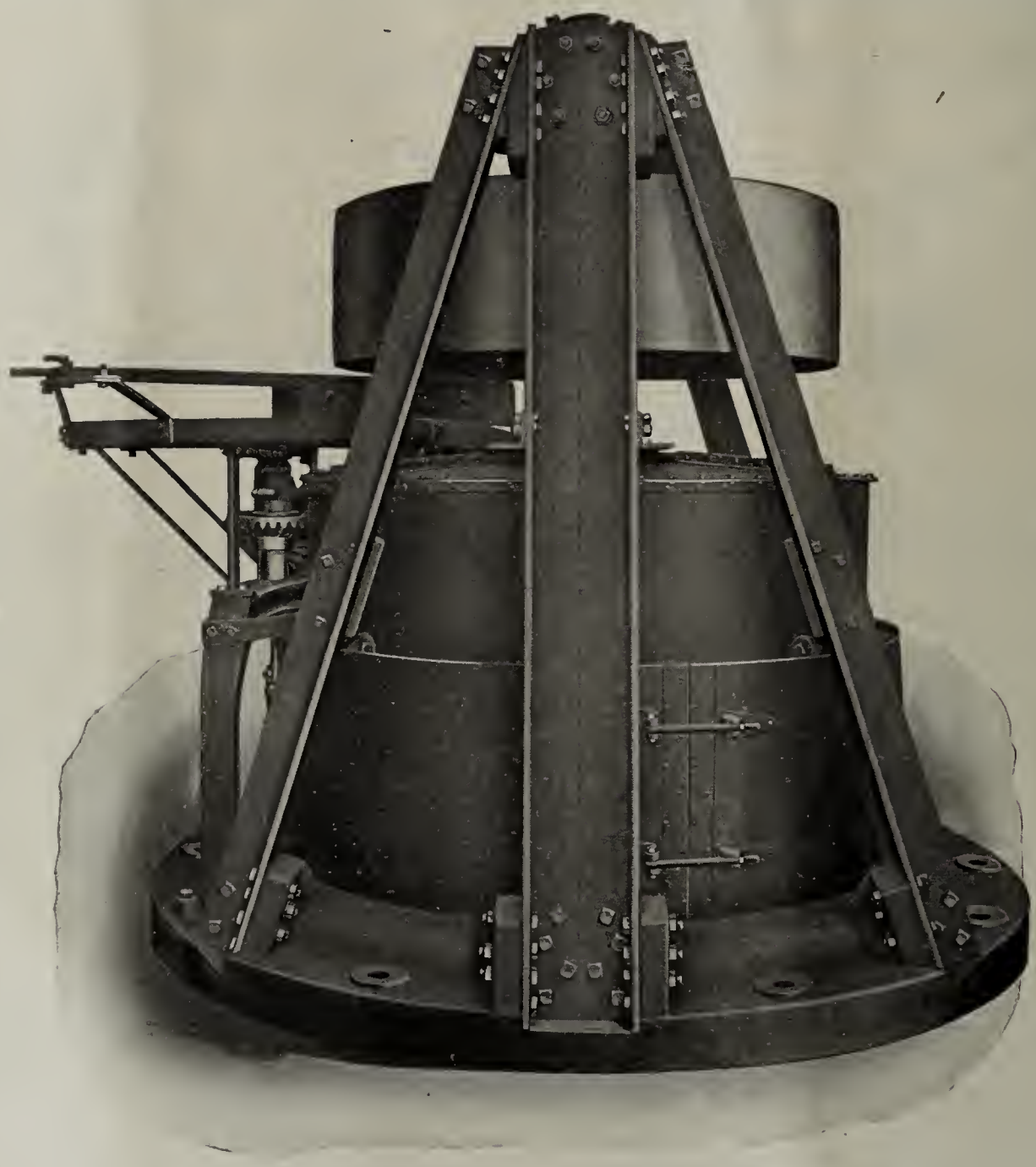
**This Latest Bradley Product is one worthy of investigation. Twenty-two of these big preliminary mills have been sold. No other new mill has ever equalled this sales record in such a short period.**

***THE BRADLEY HERCULES IS A PRELIMINARY PULVERIZER ONLY —NEVER SOLD FOR FINISHING CEMENT MATERIALS***

**But as a preliminary it is wonderful—five years in operation—not an experiment.**

**55-60% thru 100—35% thru 200—98% thru 20.**
**Limestone—30-40 tons per hour. Clinker 130-175 bbls. per hour.**

**Simple and economical in operation. Small power consumption per barrel.**
**Increases the output of any tube mill. Saves labor. Simplifies the plant.**



**Why not investigate? Is an efficient Agricultural Limestone Producer as well as Cement Material Reducer.**

## Bradley Pulverizer Company

**Boston, Mass. London, England Works, Allentown, Pa.**

**Makers of the GIANT GRIFFIN AND BRADLEY 3 ROLL MILLS**

# Cement and Engineering News

Vol. 30 CHICAGO, NOVEMBER, 1918 No. 11

## Bridging the James River at Richmond, Va.

### Structure Consists of Eighteen Reinforced Concrete Arch Spans

The bridge that the W. W. Boxley Company, of Roanoke, Va., is now building across the James River at Richmond, Va., will require 40,000 yards of concrete and about 1,500,000 pounds of steel rods.

This structure is 2,278 feet long and 32½ feet wide, stands 100 feet above the water surface, and it is to replace an old steel bridge immediately adjoining.

It is made up of 18 arch spans. There are two 60-foot arches at the south abutment, one 60-foot arch at the north abutment, three 122-foot spans and twelve 116-foot spans.

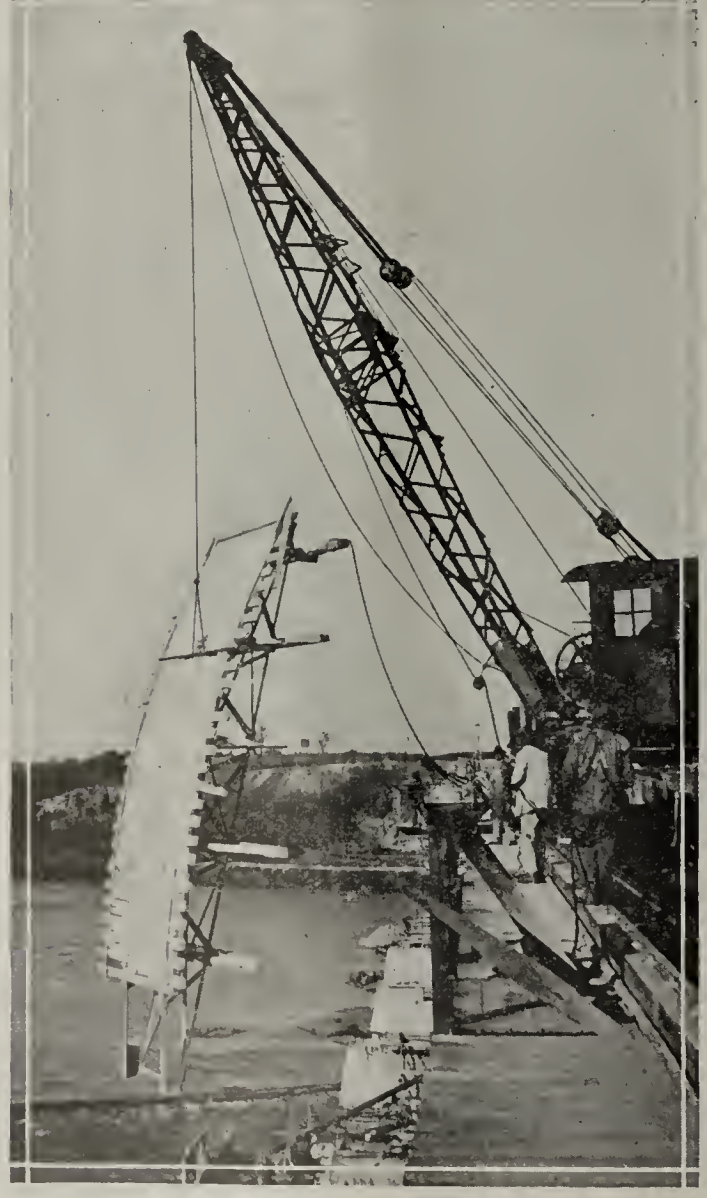
The piers are 38 feet long and vary in thickness from 14 feet to 20 feet, and up to a height of about 25 feet above the surface of the water are solid concrete. These piers rest upon solid granite which was encountered a short distance below the river bed.

All construction operations were carried on from the before-mentioned adjoining steel bridge. There are two mixing plants, one at each end of the bridge.

Here is shown one of the mixing plants, the derrick that supplies it with material, and a flat car and crane that transport the concrete to the old steel bridge, from where it is distributed.

A small locomotive hauls the concrete out on the steel bridge, from various points of which chutes carry it to different parts of the work that are at least 16 feet below the top of the bridge.

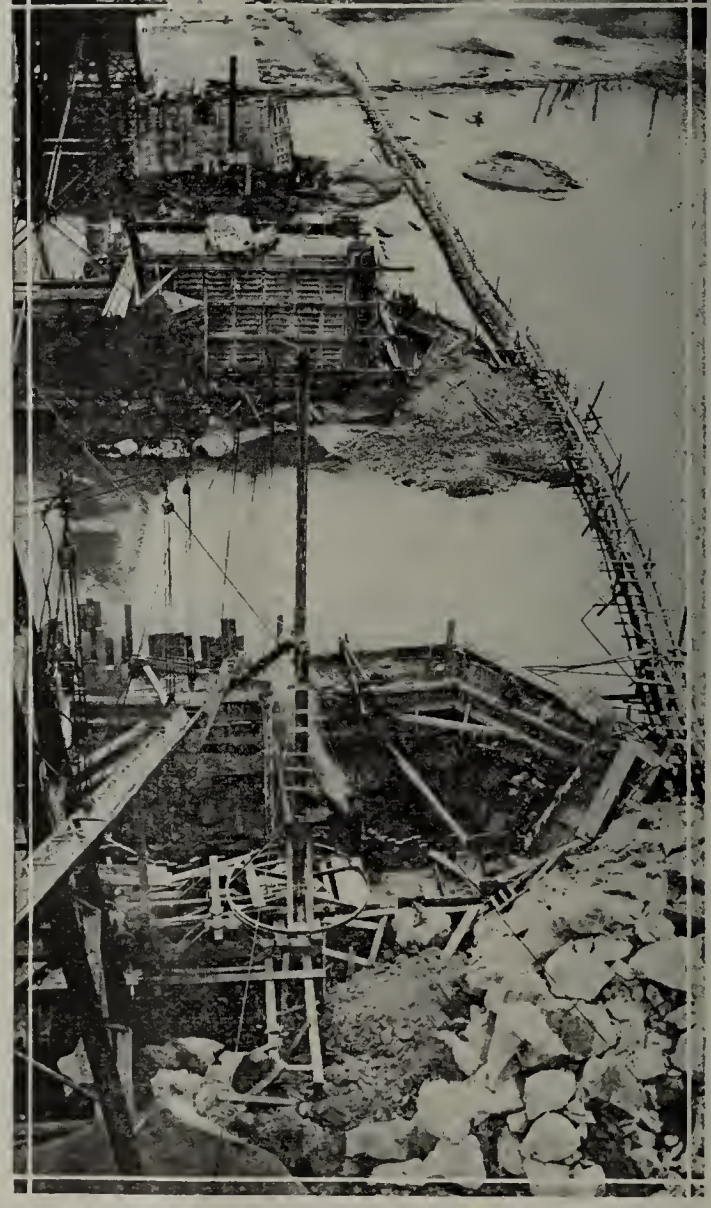
For distributing concrete to points above 16 feet



Locomotive crane lowering a form section.

below the top of the bridge, a wooden tower 12½ feet high was built upon a flat car.

Two locomotive cranes are used for handling concrete, steel, forms and other materials, and there is a stiff-leg derrick for supplying aggregate to the main mixer. On all of these machines, as well as on the spouting systems, considerable Leschen Wire Rope is to be found.



This gives some idea of the foundation work.

This structure is being built jointly by the Richmond, Fredericksburg and Potomac Railroad and the Atlantic Coast Line Railroad.

# Editorial

## Mobilizing American Business

By George Frank Lord, Advertising Manager—Du Pont Co.

One reason why large corporations are usually more successful than small concerns is that the big enterprise continuously watches the drift of events, and with surprising accuracy forecasts the future. In like manner, the nation that succeeds is the nation that accurately gauges the progress of the world and its effect on future years.

The circumstances surrounding the great world war have been a most convincing lesson in the value of preparedness, of a study of the underlying conditions that obtain throughout the world, a forecast based on this study, and a preparation for eventualities so forecast.

We have all seen what great losses were caused by the unprepared condition of every country engaged in the war except Germany. It has been a bitter lesson, yet evidences multiply on every hand that the lesson has not gone home, because with few exceptions very little effort is being made in this country to prepare America for the commercial struggle that is bound to follow the war, and which will be of far reaching significance.

It must be remembered that this war was commercial in origin. Germany sought "a place in the sun" and "freedom of the seas," for the further commercial expansion of the German Empire, and the welding into a solid unit the outposts she had established in every civilized country. Her enormous scheme of a commercial expansion was restricted by her limitations in resources, the smallness of her territory and her secondary position as a naval power. The Monroe Doctrine also constituted a hindrance to her exploitation of South America. It was the hope and expectation of her military leaders that the great war, started when she was ready and when no one else was ready, would gain for her supremacy over all the obstacles that confronted her, and would leave her first with the commercial domination of the world, and, as a result, the ultimate political domination.

Her submarine warfare has been conducted not merely for the purpose of stopping the shipment of troops and supplies to her enemies, but also to reduce the available competitive ship tonnage for the period after the war. The minimum she will strive to obtain at the final peace conference will be the control of raw materials sufficient for proceeding with her scheme of commercial expansion. This has already been announced as an absolute necessity for the continued existence of Germany as a world power.

Foreseeing her inevitable withdrawment from northern France with its great stores of raw materials, she is bending every energy to secure and retain the control of Russia, which is perhaps the world's greatest undeveloped storehouse of raw materials.

Consider what will be the position of America at the dawn of peace.

America will be the richest country on earth, holding certificates of indebtedness of all her allies to an enormous extent, having tremendous stores of untouched resources in minerals and agricultural lands, in water power and in man power.

The nations of Europe and Asia, on the contrary, will be impoverished, in debt, short of man power and either lacking natural resources or the money, men and machinery necessary to develop them. This will leave America as a shining target for attack, commercial in character at first, possibly military in character later on. We shall have everything that every other nation needs and must get for its mere existence. We shall, for the time being, be in control of the world; then will come the true test of America's magnitude as a world power. Will she be able to realize fully on the advantages of her position, while at the same time continuing her constructive assistance to honorable aims of foreign peoples, or will she simply be a puffed-up easymark, gorged with plenty, bejeweled with wealth, awaiting the hand of the despoiler?

If there is one characteristic of the American people that is outstanding, it is versatility, the ability to do more than one thing well and achieve results under difficulty. In this war we have accomplished the seemingly impossible in our production of military supplies, our shipments of food and our organization of a great army and navy, and we have done this while the country as a whole was living its ordinary life with almost its usual degree of comforts and pleasures. Every thinking person realizes that the time has come when our pleasures and luxuries must be largely curtailed, but as yet our comforts and ordinary requirements have scarcely been touched, and it is certain we will never by this war be forced to undergo the privations and sufferings that have been the lot of all the other belligerents.

Just now when we are facing large increases in our military activity, the patriotic impulse and demand are that the nation go on a war basis to the largest possible extent.

There is, however, great confusion of opinion as to what constitutes a war basis. To what extent may the normal activities of home life, farm life and business life be altered without indirectly setting up a resistance to our war progress? It seems obvious that if all businesses are placed on a war basis, with earnings restricted by government prices and government taxation, there will be a gradual diminution of the ability of the country to finance the war. It seems evident that we must go on with the creation of wealth out of the mineral and agricultural resources of the country and our own labor in order that we may continue to pour into the treasure chest of the Allies the money necessary to finance the war.

Therefore, from this point of view, labor and industries not directly concerned in the production of war material become essential to the production of wealth to back the war.

But there is another phase of this subject to which America has seemingly given little attention, as, however, is not the case in France, England or Germany, and that is preparedness for the commercial struggle to follow the war, and the first essential to such preparedness constitutes the maintenance to the fullest possible extent of our facilities for producing peace products, while at the same time doing our utmost to help win the war.

Consider, if you please, the condition that America would be in if at the end of the war every industry in the United States were on a 100% war basis. We would face the desired return to peaceful pursuits of 5,000,000 soldiers and probably 20,000,000 war workers. Think of it! Twenty-five million people, a majority of whom would be heads of families, in the sense that they would be the chief earners of families. They would represent approximately one-third of the population of the United States. Such a situation would be fraught with tremendous dangers, if no provision were made to meet it.

In Great Britain, as a result of a careful study of the prospective situation at the end of the war, it has been decided to hold her returning army intact at government expense until such time as the soldiers can be gradually absorbed by industry. More than six months ago France sent a commission to this country to arrange for the purchase of machinery for re-establishing her factories that have been destroyed or stripped of their equipment.

The world has never before experienced so gigantic an upheaval as this war. The great wars that have preceded it shrink into insignificance compared with this one, and yet every one of those wars was followed by a long period of disturbed conditions that in several cases resulted in drastic revolutions.

It must be apparent that some of the best thought of this country must now be applied to this gigantic problem. Every large industry must now perfect its plans for the continuation of its peace business after the war on the largest scale consistent with its capital and facilities.

The fate of the world, as well as America, hangs in the balance, because our answer to the problem will be not merely the means for taking care of America in this crisis; it will have a far-reaching influence on the future of every country in the world. Everything in Europe that is needed in modern civilization has been subject to destruction in this war—railroads have been torn up, rolling stock destroyed. New rails, new locomotives, new freight cars, must be provided, and America will be the only quick source of supply. Mines, mills, cities and villages have been destroyed or put out of commission. America must rebuild them. Agricultural implements essential to keep Europe from starving have been destroyed by military decree, or through rust and decay. The first move every warring nation will make after the war is to increase food production, to prevent ultimate plague, famine and anarchy, and we must supply the utensils and machinery. The building of cities, villages, mills and houses will call for material and labor that will not exist in Europe. America must supply them. Pending the production of its own food, Europe will starve unless we feed it, as we are doing now. Little, if any, funds will be available for this vast reconstruction unless we furnish them. Does not all this evidence show that America must do two things at once—carry on the war and carry on peace production? Must we not be ready at the end of the war to provide living employment for 25,000,000 people? Is it not obvious that we shall need the effort of these 25,000,000 people and of all the other people in the United States to accomplish the gigantic task that fate has set before us?

E. I. du Pont de Nemours & Company is a large business which draws supplies from the four corners of the earth and makes products for all the world. It is one of those concerns that study fundamental conditions and the trend of events. It has been of vast service to the Allies and to the United States in this war, because it believed in preparedness, and its war-time achievements can properly be a source of pride on the part of every American in this all-American business, as they have been a source of amazement and congratulation on the part of our Allies. This company has been credited by the English Government with having been one of the few important factors that saved the British Empire in the first year of the war, and that means, of course, saving the United States, which would have been another Belgium for the ruthless enemy of the world.

And just as this company has looked ahead and planned ahead for the inevitable in war it is now looking ahead and planning ahead for the inevitable in peace. Our war activities have caused a vast expansion in our business. We have millions of dollars invested in munitions factories. More than 75,000 people are employed by this company in its present activities, of which perhaps 65,000 are engaged wholly on war work. To carry on this enormous undertaking, large capital has been required in the business. Thus at the end of the war we shall have on our hands enormous plants, large financial investment and many thousands of employes no longer needed for war work. It is our plain duty, if possible, to provide peace time employment for this capital, these plants and these employes. This is the least that any large business should plan to do, because it must be borne in mind that this minimum of effort, if successful, only takes care of the employes in this country and makes no provision for the returning soldiers. Under great difficulties we are endeavoring to build up a strong foundation for peace business. That is the object of the present development and promotional campaign we are conducting for the Du Pont American Industries.

Some business men have construed as unpatriotic any effort to continue peace business during war time. This seems to us a shortsighted patriotism, which takes no stock of the inevitable future that will confront us. This Company does not propose that it or any other manufacturer do less war work in order to do more peace work. It does propose that every one do more work and thus do both. That was the object of the Government's daylight saving law, to enable the business men and the factory workers to do their full day's regular work and a half day's other work in the remaining hours of daylight. It was not intended to provide time for recreation, but for work, and the results show that the mass of the American public fully realized this and the lesson taught in the proper utilization of spare time will have a far-reaching influence on the future of America.

We believe that every business and every individual should daily consider not only what it or he is doing to help win the war, but what to help fortify America for this gigantic task after the war. As already pointed out, we have not yet suffered privation in this country, because wages have been high and the sources of food and material have been regulated by governmental action to see that all are cared for. But after the war it will be a different story, unless we are very careful. The whole world will suffer privations and famine and political upheaval, if wise plans are not laid now and acted upon without delay to insure an orderly, constructive period after the war.

The writer suggests that if the Government has not already taken steps in this direction, it would be well for a commission to investigate at once the peace possibilities of every industry in the United States, to study and catalog the labor absorptive power of every business and every community, to work with boards of trade and associations of manufacturers, and railroads, mines and quarries, to ascertain what can be done immediately after the war in the undertaking of

manufacturing and industrial and engineering projects that will provide employment and will help to care for the civilized world. This study should include an analysis of the undeveloped agricultural resources of America and what can be done to make our undeveloped lands available for farming. If, as it seems probable, this war is to end in 1919, how little time is left to analyze and organize this vital information!

## A Modern Motor-Driven Lime Plant

During the past four years, the Vermont Marble Company have been operating the largest business of its kind in the world. Together with the vast amount of valuable stone taken from the quarries there has also been a great deal of unnecessary waste, which has consisted chiefly of small and insound blocks of marble. Conservation to the extent of using some of this waste as crushed stone has been a part of the company's routine work. This, however, left an amount of it to be disposed of.

Three years ago, experiments were made on different grades of marble to determine what of lime could be obtained by burning it. The test made such a good showing that the company decided to build a modern well-equipped lime plant. Furthering their plans, a plant designed by the Fuller Engineering

**Fine Pulverizing Mills.**

Company was started during the summer of 1915. In the early spring of 1916 the first lime was produced.

The location of the plant near the extensive West Rutland quarries, and the sidings which run on both sides of the plant, makes possible the bringing in of coal and waste marble, as well as providing a way to take out the finished product. The main building is of steel, 420 feet long and 40 feet wide. A producer house, 80 by 30 feet, lies just east of the main building and the office, coopers' shop, and transformer station are just west of the main building.

Power is brought from the Vermont Marble Company's transmission system, to the 25 by 35 ft. transformer station, built of waste marble, over two 11,000-volt, three-phase, 60-cycle lunes, where it is stepped down to 460 volts by three 200 k.v.a. self-cooled transformers. These two 11,000 volts lines are normally in phase, so that the bank of transformers can be shifted from one to the other without any interruption of service. This arrangement was necessary to avoid shutting down the plant when it was necessary to change insulators or make repairs to either line. The transformers are of large enough capacity so that two connected in open delta will not be seriously overloaded at any time. The fact that power must not be off for more than a few minutes, owing to the liability of warping the revolving kiln, necessitated the extra precaution in maintaining two power lines, which are normally in phase, but may be fed by either of two entirely different power systems, if one line or system is out of service.

A 230-volt motor-driven generator at the main West Rutland station, nearly one-half mile south of the lime plant, furnishes the direct current for the 25-ton traveling crane. All motors, except those for the crane, are 440 volts, three-phase, 60-cycle induction type. A 460-volt to 115-volt lighting transformer furnishes the light for the plant.

The plant and its operations can best be understood by following the products through from the time the

**General view of kiln.**

stone is delivered to the plant on flat cars loaded with waste marble from the nearby quarries and blackpile.

The material as it comes to the plant is in miscellaneous sizes and if over 12 inches the blocks are handled by slings and craned into the 60 by 48 jaw crushers. From the jaw crusher it passes by gravity with sizes below 12 inches through a No. 6 gyratory crusher, set to reduce down to 2 inches and less. The material is then elevated and screened. The screen rejection is run through a set of 36 by 16 Superior rolls, to reduce it to one-half inch thickness or less. All of the material is then elevated and conveyel into storage or kiln bins, whence it can be drawn any time it is desired.

This department has eight motors of 272 hp. total and can reduce 25 tons of stone per hour from blocks of 150 cubic feet to stone one-half inch thickness or less.

| Motor on— | Horse-power |
|---|---|
| Jaw crushers | 150 |
| Gyratory crusher | 50 |
| No. 1 elevator | 7.5 |
| Screen | 7.5 |
| Rolls | 35 |
| No. 2 elevator | 10 |
| Conveyor | 5 |
| No. 3 elevator | 7.5 |

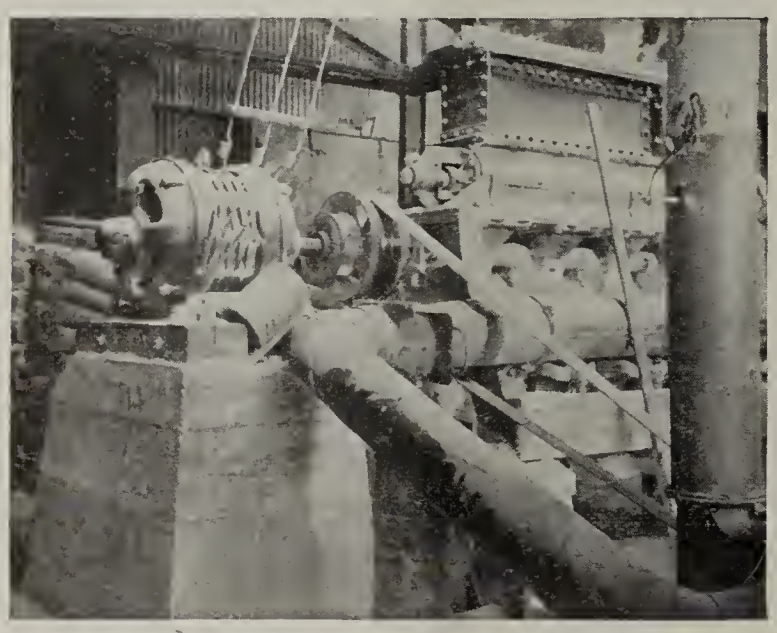
The crusher stone is fed automatically from the kiln bin into the bin by a cradle feeder. The kiln is patented after the familiar cement design, eight feet in diameter, 200 feet long, installed with a four per-cent pitch. The kiln is belt driven from a 30 hp. variable speed motor, geared to give ten speeds, from 0.5 to 1.5 r.p.m., as desired. It was built by the Vulcan Iron Works, Wilkes-Barre, Pa.

The producer gas is introduced through a flue into the lower end of the kiln and in burning furnishes the heat for calcining the stone as it gradually rolls through the revolving kiln. A temperature of 2,200

degrees E, is maintained in kiln, which drives off the CO from the stone, leaving the quicklime. The hot lime drops from the lower end of the kiln into a revolving cylinder, in passing through which it is cooled by the draft of air on its way into the kiln to support combustion. The cold lime is elevated from the discharge of the cooler and after screening is deposited into large storage bins.

The producer gas is made as used in a 10-foot Chapman mechanical gas producer from Pennsylvania gas coal. The coal is discharged from the hopper bottomed cars through a coal crusher by conveyor and elevator into a large storage bin, or into the producer bin. From the producer bin it is fed as needed by the attendant. The producer is blown by a steam jet, resulting in lean gas, containing over 50 percent nitrogen, which in burning gives a mellow flame. The gas is conveyed into the kiln by a heavy brick lined flue having suitable openings for cleaning. Producer gas which gives a long flame of comparatively low temperature and of considerable volume is used. Gas is preferable to coal in the cases where clean lime is desired.

The kiln operation is checked by a Bristol recording tachometer, as to speed and output, while the quality is recorded by a Truesdell automatic sampler. This department has nine motors and produces 60 tons of lime per 24-hour day.



Bagger operated by a 15 H. P. induction motor.

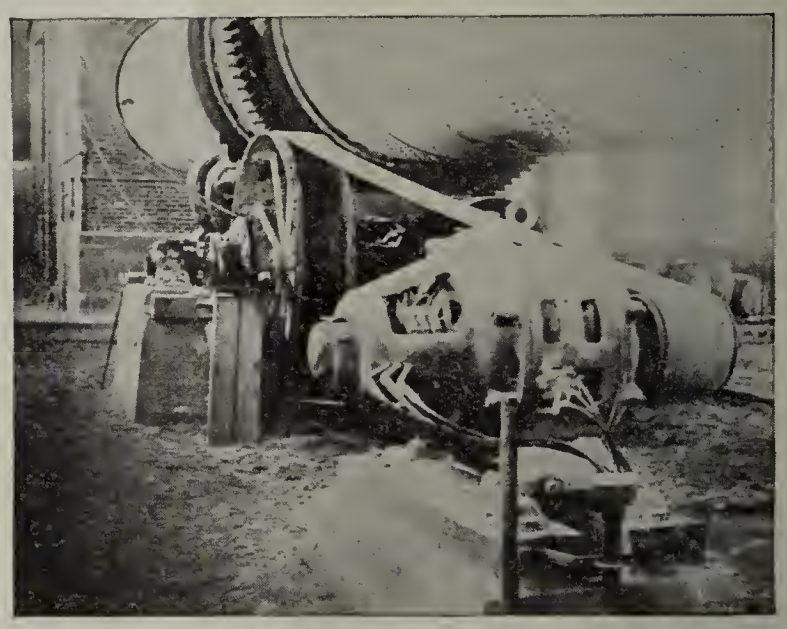
| Motor on— | Horse power |
|---|---|
| Coal crusher | 10 |
| Bin conveyor | 5 |
| Coal elevator | 7.5 |
| Producer conveyor | 5 |
| Producer drive | 5 |
| Kiln | 30 |
| Dust conveyor | 5 |
| Cooler | 10 |
| Lime elevator | 10 |
| Total | 87.5 |

## Hydrating Department

From one of the storage bins containing CaO, lime is automatically drawn for hydrate manufacturing. The Kitzer process is used which essentially is mechanical stirring of the mixture of lime water through 75 feet of 24-inch piping. If the proportions of lime and water are correct, the dry, fluffy, white powder of CaO H results at the end of the stirring tube. As this powder may contain some grit or other impurities, it is air separated by means of Raymond mills, cyclones, and canvass tubes into Vermont hydrate and Superfine hydrate, while the impurities are rejected. Some idea of the fineness of the hydrate may be had from the statement that less than six percent is retained on a 200-mesh screen, while the Superfine is still finer. These materials are packed into paper bags by a Bates bagging machine. This department has six motors and can produce 4 to 5 tons of gyrate lime per hour.

| Motor on— | Horse power |
|---|---|
| Hydrater | 15 |
| Raymond mill | 5 |
| Raymond mill | 5 |
| Separating fan | 20 |
| Separating fan | 20 |
| Bagging machine | 15 |
| Total | 80 |

Besides the equipment described, the plant has a cooper shop with a capacity of 500 barrels per day.



Kiln driven by 30 H. P. 720 R. P. M. motor.

Barrels are delivered into the kiln building automatically as needed by a barrel elevator and run. The elevator is run by a machine parts, barrel stock, barrels, tools, etc., complete the layout.

| Miscellaneous motors— | Horse power |
|---|---|
| Air compressor | 15 |
| Pump in cooler pit | 3 |
| Pump in quarry pit | 2 |
| Barrel elevator | 2 |
| Total | 22 |

There are in the plant 27 induction motors with a total horse power rating of 402, and three direct-current series motors on the crane with a total of 55 horsepower. The induction motors are squirrel-cage type except the 150 hp. kiln motors, these two being of the Wood-secondary type, the crusher motor for starting duty and the kiln motor for continuous running at any point between one-third and full speed. The plant uses between 25,000 and 30,000 kw-rs per month.

The lime manufactured by the Vermont Marble Company is of an exceptional purity and likewise of a high grade. It is granular, similar to sugar, rather than like the so familiar lump lime. Due to the fact that it is burned at a comparatively low temperature, it slakes very rapidly, so quickly in fact that it is advisable to stir the lime into the mixing water in order to keep the slaking temperature within reasonable bounds. In the market this product is favorably received on account of its smooth-working, putty whiteness, and causticity.

# Comparative Analysis of Gravel Screens

By Raymond W. Dull

**The Inclined or Gravity Screen.**—A screen in its simplest form is the inclined plane or gravity screen. The main difficulty with this type of screen is that the material after traveling a few feet accelerates to such a velocity that the holes in the screen are passed over by particles which should pass through. The length of the effective travel is very short and the results obtained are very unsatisfactory.

Engineers might say, why not make the shape of the screen or curvature of the path such that the velocity is constant or uniform and without acceleration? Fig. 1 is referred to as a possible curve for such a screen. Let A—B represent the curve and our problem is to find the shape of the curve or its equation.

The acceleration of a particle passing down an inclined plane without friction is g sin $\theta$, where $\theta$ is the angle of the inclination with the horizontal. The retardation due to friction or negative acceleration is gf cos $\theta$ when f =coefficient of friction. Therefore,

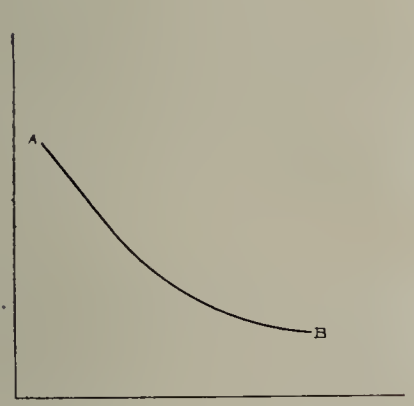



Fig. 1

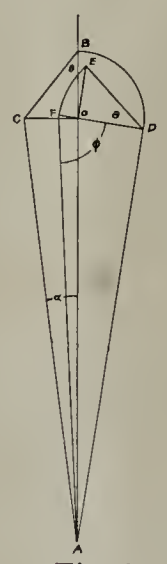



Fig. 2

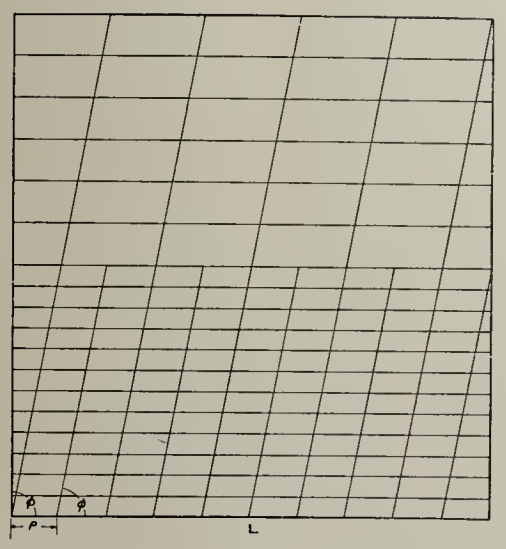



Fig. 3

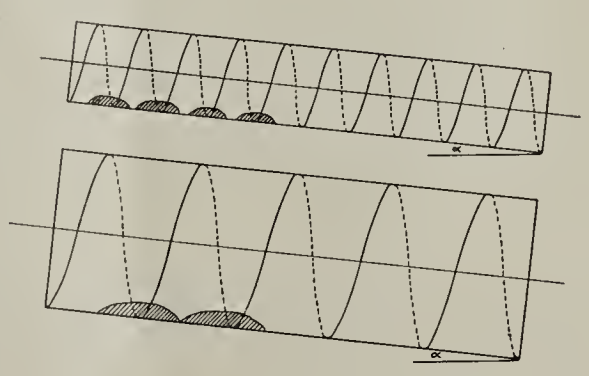



Fig. 4

the acceleration of the particle passing down the plane at any instant is

$$g\ (\sin\theta - f\cos\theta)$$

Now since we desire mantaining a uniform velocity without acceleration

$$g\ (\sin\theta - f\cos\theta) = O$$

$$\sin\theta = f\cos\theta$$

$$\frac{\sin\theta}{\cos\theta} = f = \tan\theta$$

The result shows that the curve resolves itself into a straight line the tangent of which is equal to the coefficient of friction. In other words, if the screen is set at the angle of friction the particle will slide down the screen at the same speed at which it started. Unfortunately, we have quite a variation in the coefficient of friction, for some particles will slide down while others will roll down. Therefore, by setting the screen for the former will result in giving the latter considerable acceleration. Another difficulty with this type of screen is that particles will lodge in the holes of the screen and block the screen unless removed by some means.

**The Cylinder Screen.**—The cylinder screen is the oldest type of revolving screen in use. They are set at a slightly downward slope to cause the material to travel through the screen. The path of the particles on the screen surface is a helix. In order to determine the pitch of the helical path of the particle in a cylinder screen we will assume a certain angle $\alpha$ as the inclination of the screen with the horizontal. Every element of the screen surface parallel to the axis will have this angle with the horizontal, assuming that these angles are taken in vertical planes.

First assume a horizontal plane with the line A O in that plane. (See Fig. 2.) Assume that the vertical plane through A O is rotated about A O through an angle of 90° or into the horizontal plane. Now draw C A O equal to $\alpha$ then C A represents an element of the cylinder. Next draw C B O equal to

$$\theta = \tan^{-1}\frac{C\ O}{O\ B} = \text{angle of friction.}$$

We know that the particle will travel in some direction in the normal plane which has an instantaneous angle of $\theta$ with the horizontal plane. Rotating B C A back again into the vertical plane about B O A as axis, we will determine the intersection of the normal plane with the horizontal plane and rotate the normal plane about the line of intersection into a horizontal, and determine the true angle which the path makes with the cylinder element. Rotating O B about vertical axis, O making the arc B D, and draw A D tangent to the arc, A D is the line of intersection of the normal plane and the horizontal plane. This also establishes the direction of the path of the particle or O D which forms the angle A O D of a vertical plane passing through O D and another through A O measured in horizontal plane.

In order to get the true angle with the cylinder element it is necessary to lay out the angle $\theta$ as O D E and rotate the normal plane into the horizontal plane about A D as axis, which gives us A F D or $\Phi$ as the true angle which the path of the particle makes with cylinder element.

To reduce this analytically in terms of the given angle, we have

$$C\ A = A\ F = \frac{C\ O}{\text{Sin}\ \alpha}$$

$$C\ B = D\ F = \frac{C\ O}{\text{Sin}\ \theta}$$

$$\text{Cos}\ \Phi = \frac{D\ F}{A\ F} = \frac{C\ B}{C\ B} = \frac{\frac{C\ O}{\text{Sin}\ \theta}}{\frac{C\ O}{\text{Sin}\ \alpha}} = \frac{\text{Sin}\ \alpha}{\text{Sin}\ \theta}$$

$$\Phi = \text{Cos}^{-1}\frac{\text{Sin}\ \alpha}{\text{Sin}\ \theta}$$

In order to compute the length of the helix, we will develop the surface of the screen and indicate the path of the particle. (See Fig. 3.) The pitch P of each turn of the spiral $= \frac{\pi D}{\tan \Phi} = \frac{\pi D \cos \Phi}{\sin \Phi}$

Length of each turn of spiral $= \frac{\frac{\pi D \cos \Phi}{\text{Sin } \Phi}}{\cos \Phi} = \frac{\pi D}{\text{Sin } \Phi}$

$$\frac{P}{\cos \Phi}$$

Number of turns $= \frac{L}{P} = \frac{L}{\frac{\pi D \cos \Phi}{\text{Sin } \Phi}} = \frac{L \sin \Phi}{\pi D \cos \Phi}$

Total length of spiral = length of turn × number of turns $= \frac{\pi D}{\sin \Phi} \times \frac{L \sin \Phi}{\pi D \cos \Phi} = \frac{L}{\cos \Phi}$

But $\text{Cos } \Phi = \frac{\text{Sin } \alpha}{\sin \theta}$

Total length of spiral $= \frac{L \sin \theta}{\text{Sin } \alpha}$

Assume $\theta = 45°$ and $\alpha = 7°$

we would have length of spiral $= \frac{.707 \text{ L}}{.1219} = 5.8 \text{ L}$

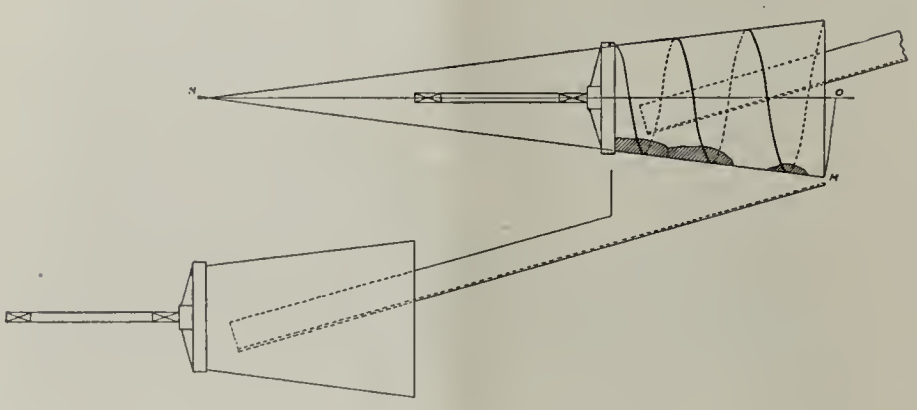


Fig. 5

It therefore follows that the length of travel in a cylinder screen is independent of the screen diameter, but simply depends on the length of the screen and the inclination of its axis. This fact no doubt will be a great surprise to many, including screen manufacturers, for screens of large diameter are usually given considerably higher rating than they should have. The length of the travel of a particle in a screen 36 in. diameter and 12 ft. long is identical to the path of a particle in a screen 72 in. diameter and 12 ft. long, if both screens are set at the same inclination. This path is about 70 ft. long. The advantage of the large screen, however, is that the distance between the coils of the helix is greater, which allows the material to spread out more and make a wider helix. See Fig. 4.

**Overhung Conical Type of Screen.**—We will next take up a type of screen used a few years ago quite extensively in gravel washing plants. It is known as the overhung conical type. Fig. 5 illustrates the screen and the manner in which they were used.

To determine the angle of advance of the spiral, we will assume line A B, Fig. 6, as the intersection of normal plane drawn tangent to the screen and forming angle of friction with a horizontal plane. Draw A C equal to M O of Fig. 5, then draw C D, making angle C D A = $\mu$ or angle of friction. Draw D E parallel to A B, making length A E equal to M N in Fig. 5. Then E A B (Fig. 6) is equal to angle of advance of the helix. This is evident by assuming that the normal plane is rotated into the horizontal plane. The element A E and the axis are then in a vertical plane through A E and the perpendiculars to A B and A E give the angle of advance and by geometry would be equal to angle E A B.

To trace the path of travel it is necessary to develop the surface of the screen cone. The path then takes the curve of the logarithmic spiral as shown by Fig. 7 and when drawn in on the cone takes the form as shown by Fig. 5.

The length of the spiral is $\frac{R - r}{\cos (90° - \Phi)}$ where R is the length of the cone element A E from the apex to the large diameter of the cone and r the cone element from apex to small diameter of cone and $\Phi$ the angle of advance of the spiral just found.

Assuming the same slope for the screen as taken for the cylinder screen, we find that the angle of advance is approximately 10° and R = 18.18 ft., r 12.1 ft. cos 80° = .1736, and the length of spiral is 34.7 ft. for a cone screen 72 in. long and 1½ in. per foot slope. This is practically the same length of travel for a cone screen as cylinder screen 72 in. long. This would naturally be expected since we found that the diameter of the cylinder screen did not affect the length of the path of the travel of the particle.

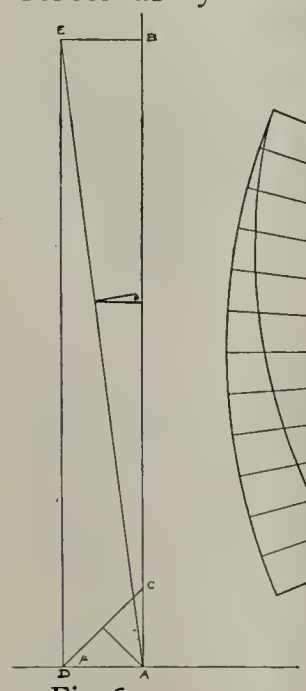


Fig. 6

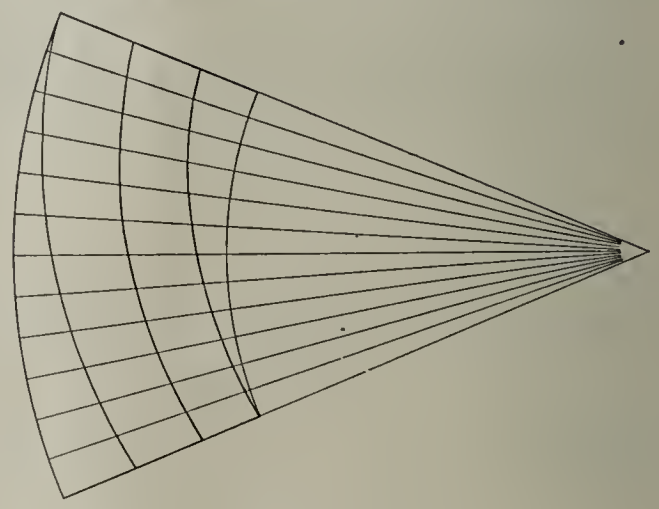


Fig. 7

The form of the logarithmic spiral formula is $r = ae^{m\phi}$ and by use of hyperbolic logarithms the curves of Fig. 7 are plotted.

**Inclined Conical Screen.**—The screen which we will next discuss is the well-known inclined conical screen, which is mounted on the same shaft as shown by Fig. 8. The material in this screen travels ahead while the screen shown by Fig. 5 has a backward flow. These screens have an entirely different taper than the other style and are designed to give the best pitch of the spiral and a minimum pitch for the flume from screen to screen. These two angles, together with the given diameter of the large end of the screen, determine the shape of the cone.

A different diagram is necessary to determine the angle of advance of the helix as well as the path of the particle.

Assume line O A as the intersection of a vertical plane through the screen or cone axis and a horizontal

plane through the apex O. Draw O B, making angle of friction with line O D, which is at right angles to O A. We next locate E, knowing that it is equal to N P (Fig. 8) from B O and a distance P H (Fig. 8) from D O. Now drop a perpendicular E H to B O and rotate H O into O D. We now have the screen element in the horizontal plane and can lay off element M N (Fig. 8), as D J or as H K before rotation about O A. The axis of the screen is in the vertical plane through O. L. Rotate the vertical plane about O A in figure to right in diagram and we have O L as the axis and K O as the projected co-ordinate of the element. Assume a point as M and draw M N. perpendicular to O L or cut the element with a perpendicular plane. Now transfer the intersection of this plane with the normal plane through the element and we are ready to rotate the normal plane into the horizontal plane, which gives us the true angle advance of the helix or Φ.

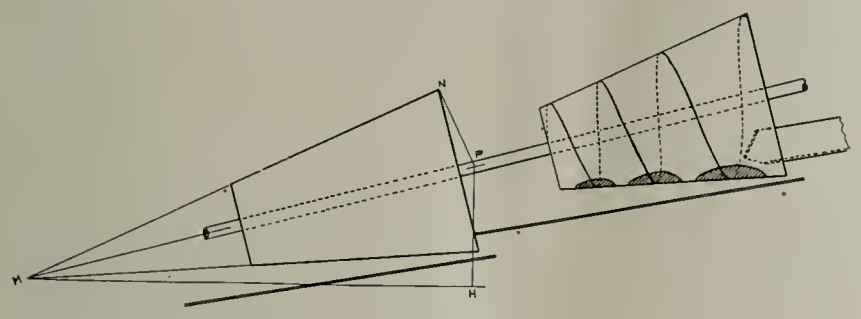


Fig. 8

The helix can then be drawn as shown by Fig. 10 in same manner as before except in the reverse order. We find that the length of this helix has the same length provided the pitch of the helix is the same, but usually the pitch is a little less and the path a little longer.

We now come to the most interesting analysis of these paths.

The cylinder screen has a spiral with uniform distances between the coils. When a quantity of material is introduced into the screen it can spread, depending on the distance between the spirals. The greater the diameter the greater the spread. Now as the material travels through the screen and the amount gets less and less since the greater portion goes through, we must overcrowd the screen at the start or we are not using the full width between the coils at the lower end.

The screens illustrated in Fig. 5 have the helical paths close together at small end and the discharge between the corresponding points on the helix, or pitch of spiral increases toward the large end of the screen. The material is delivered to the small end of the screen where the material can spread the least amount, yet this is the point of maximum quantity of material in the screen.

It is, therefore, necessary to crowd the small ends of these screens to make use of the wider path at the large end of the screen. In other words, the increased pitch of the helix is in the wrong direction. The piling up of the material at the small end interferes with the pebbles passing through the openings and a large per cent of the screen area is lost.

The screens shown in Fig 8 have the wide helical path at the large end where the material is received. The paths get nearer together as the material travels along. The quantity also becomes less and less. In this screen the spirals are in the right direction and the efficiency is much higher.

The cost of screens is proportional to the area of screening surface. Another consideration in comparing screens is the correct speed for screens. It has been found by experiment that a surface speed of from 175 to 200 ft. per minute is the most efficient; if slower than this the capacity is cut down and if faster the screening efficiency is lowered because the pebbles do not have sufficient time to go through. With the cone screens the speed should be computed for the large end, for if speeded according to small end the speed of large end would be excessive.

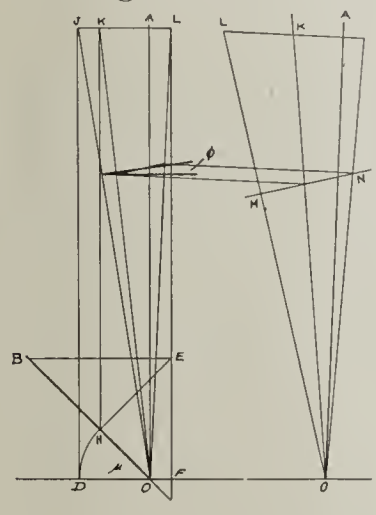


Fig. 9

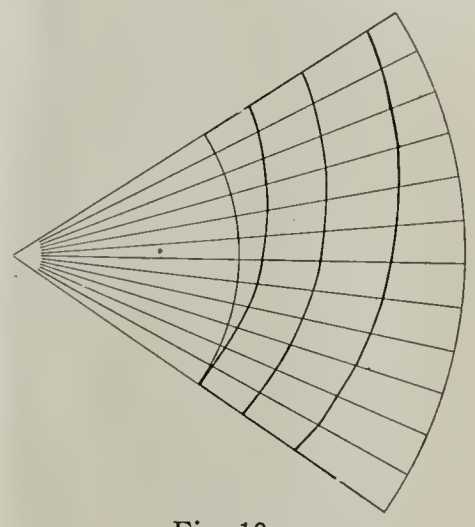


Fig. 10

This results in a further cut of efficiency in screen Fig. 5, because the bulk of the material is at the small end where the screen speed is greatly reduced; while with the screen Fig. 8 the correct speed is at the large end where the greatest quantity of material is received while the decreased speed of the small diameter does not cut down capacity much because the quantity of material is then so small.

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## Rusting Steel Chimneys Coated with Concrete by Cement Gun

Five steel stacks, at the Pittsburgh Crucible Steel Co.'s Midland works, which had become very badly corroded in service, were recently covered entirely on the outside with a reinforced-concrete shell, at comparatively small expense and without putting the stacks out of service, except for a few days. The concreting was done with the cement gun, operated by a workman standing on a scaffolding in the first two chimneys, and in the more recent work on a hanging scaffold.

The stacks are 125 ft. high and approximately 6 ft. in diameter at the top, with an outside diameter of 12 ft. at the footings. The steel in the plates was very badly corroded from the gas which found its way through the brick lining of the stack. Corrosion was very general, and in places a man could thrust his forearm through the plates. The coating comprised a self-supporting annular ring of reinforced concrete, varying in thickness from 8 in. at the base to 3 in. at the top, the reinforcement being securely fastened to the steel plates of the stack itself. At each ring of the stack, that is, at vertical intervals of about 5 ft., hook bolts were tapped into the plates of the stack. These bolts carried horizontal steel bands held a fixed distance about 2 to 4 in. away from the shell. These bands in turn carried vertical reinforcing rods of square twisted steel, around which was wrapped the annular ring of wire mesh.

## Bulk Cement

By W. R. Harris of the Portland Cement Association

The question of whether to use cement in bulk or cement in packages is of vital interest to every concrete product manufacturer, for he should be anxious to do his part in making the nation more efficient and save cotton which is needed for the prosecution of the war.

He can assist in increasing the efficiency of American industries by making his own industry efficient and by eliminating waste in his plant. I believe that every products manufacturer would hasten to equip his plant for handling bulk cement if he realized the saving of money, labor and trouble. Elimination of the sacks removes the following losses: Labor, unloading cement, damage, storage, counting, shaking, bundling, cartage, return freight charges, and insurance on cement sacks. Also the interest on money tied up in sacks from the time they leave the mill until they return to the mill is an item to be saved. The saving per barrel of cement will range from 25 cents to 30 cents and any plant using on the average of fifty barrels per day for three hundred working days per year will save approximately $4,300 per year, which is equivalent to 6 per cent interest on an investment of $71,666. If he uses but twenty-five barrels per day for three hundred working days per year, the above figures would be reduced one-half.

The first cost of equipment necessary to effect this saving should be regarded as an investment in plant and to arrive at the net saving which would be made, the following item should be calculated: Interest on investment at 6 per cent per annum; depreciation 10 per cent per annum; cost of operating and maintaining the machinery.

It will be of interest to your readers to know that one concrete products manufacturer is able to unload one 250-barrel car of cement with a power scoop and one operator in from three to four hours and on one occasion, on a wager, the operator unloaded a 250-barrel car in two hours. His equipment, in addition to the power shovel mentioned above, included a bucket elevator which elevated and deposited the cement into a rectangular bin from which the cement was removed with shovels, as the concrete mixer was placed at one side of the bin door.

It is logical to assume that the larger the amount of cement the more money the concrete product manufacturer will be justified in spending on equipment and up to a certain limit the better and more complete the machinery, the cheaper will be its cost of operation and maintenance.

When I realize the amount of money which I have spent in handling cement in barrels, paper and cloth sacks, I regret that bulk cement was not in general use in the early part of my construction experience. In addition to saving cotton, which will help to win the war, each member by making his business more efficient will reduce his manufacturing cost and increase his profits, or will be in a better position to meet competition.

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In 1900 the late George Elliott launched the Ontario Portland Cement Co. of Brantford, Ont. Now the supply of marl at Blue Lake has become exhausted and the plant has ceased operations, going into voluntary liquidation. As a result the manufacturing plant, having a capacity of 400 barrels per day, is now offered for sale. The lands at Blue Lake consisting of 64 acres and 170 acres near Beachville are for sale. The latter parcel of land contains a large supply of lime rock suitable for the manufacture of cement.

## Cementing Oil Wells Increases Output of Oil and Gasoline

By urging the cementing of oil wells in the North Cushing field of Oklahoma, in order to keep out the detrimental flow of water, experts of the Bureau of Mines, Department of the Interior, have succeeded in increasing the production of oil from 50 wells more than 2,000 barrels a day.

Aside from the commendable saving of 2,000 barrels of oil each day for war uses, this lesson in practical conservation will add $4,500 a day to the operators' gross income, and if the increased oil yield continues for one year, a not oversanguine expectation, there will be an addition of more than 750,000 barrels of oil for war purposes and $1,640,000 more in the pockets of the operators.

It is estimated by A. A. Hammer and V. L. Conaghan, the Federal oil and gas inspectors for Oklahoma, who have charge of this campaign, that the total cost of excluding the water from the 50 wells was $10,000, which means a return of about $165 for each dollar invested.

Secretary of the Interior Lane, commenting on the report from the field, said: "This is the kind of practical conservation that counts heavily just now. It not only is saving from waste one of the most precious natural resources with which the country is blessed, but is also supplying much-needed fuel for the army any navy. At the same time it is paying the operators handsomely to increase the flow of their wells.

"It happens that the crude oil from Oklahoma contains much gasoline. An increase of 2,000 barrels of crude oil a day means 500 barrels of gasoline a day, or more than 7,500,000 gallons in a year's time. This saving alone, from this restricted field in Oklahoma, is sufficient to drive every automobile in the United States an average of 20 miles, and there are 5,500,000 automobiles in the country.

"The best of it is, this is but the beginning of an enormous saving of crude oil by keeping the water out of the wells. It has taken the bureau two years to demonstrate the feasibility of using cement in the Oklahoma wells, but now that such a saving can be effected it is being adopted by all progressive oil men. I understand that the bureau has already started a campaign in the Healdton field, Oklahoma, and that, while it has not yet received a report of the actual results, it is estimated that the saving in this field amounts to more than 300 barrels of crude oil a day. In Illinois the same plan is being introduced, so that the Bureau of Mines is confident that the total savings to the country will be considerable and will go quite a distance in supplying our urgent war needs.

"In normal times, without a war for civilization on our hands, we would hail the men who are accomplishing this as benefactors of mankind."

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## Concrete for Warehouses

At a recent meeting of the American Warehousemen's Association the value of reinforced concrete for warehouse construction was emphasized. According to the report of the committee having this branch of the work in charge the initial cost of reinforced concrete is not excessive for this class of structure. Insurance rates and depreciation charges are lower, and greater cleanliness and safety are assured when it is employed. Of the 503 separate warehouse buildings owned by the members of the association, 156 were said to be fireproof, 244 non-fireproof, 32 sprinklered, with no report given on the other 71. Eighty per cent of the warehouses now being constructed are being built of reinforced concrete, according to this report.

# How to Get the Best Surface on a Concrete Road

By A. H. Hunter

District Engineer, Illinois Department of Public Works and Buildings, 302 Apollo Theater Building, Peoria, Ill.

In spite of the excellent riding qualities of pneumatic tires, together with all the experience and skill incorporated in the design of body, springs and wheel base of our automobiles, the automobile public is demanding improvement in the surface conditions of our concrete pavements. I do not feel that this is because previously constructed pavements were so decidedly inferior, but rather that with the coming of long stretches of improved surface, the novelty of riding on concrete diminishes. The traveler traversing longer units than before becomes more weary, and with the accompanying fatigue comes criticism of surface imperfections hitherto unnoticed, said Mr. Hunter, in addressing the American Concrete Institute at Atlantic City, N. J., on June 24.

Any road surface, however durable, can scarcely hope to be ultimately successful for use in our through highways unless this wearing surface presents a minimum of jar and vibration. In a properly mixed concrete, such as is used in concrete road work, we have a plastic material susceptible of being molded into a nearly perfect surface. How closely we are to approach this theoretical plane surface depends upon the care and effort put forth by the workman in finishing. Upon workmanship depends largely the riding quality of surface secured.

The impression is not to be gained, however, that proper design is not essential. It would be utter folly to neglect drainage, crown, or both horizontal and vertical alignment, but fortunately practice is becoming so standardized that most highway engineers recognize these important features in design. It is most infrequent to find a concrete pavement on which poor riding qualities may be attributed to poor engineering.

If we are to avert a reptition of past errors, certain construction features must be carefully watched. These features are to be considered from their significance as outlined in the specifications as well as their application by the layman.

Concrete pavement, Beacon street, Boston, Mass.

### Forms Must Be Rigid

Too often the layman looks upon the side forms as merely a necessary convenience for holding the concrete, thus losing sight of the fact that the proper grade and alignment of these forms are highly essential if a smooth surface is to result. Not infrequently I have visited construction work and found adjacent form boards out of both grade and line. It is probable that in so far as line is concerned, the earth shoulder will later absorb a fair amount of irregularities, but it generally follows that a form setter who does not take enough pride in his work to align the boards properly is equally careless in setting the edge to the proper grade.

In early concrete pavements, wood forms were used exclusively. These, when properly used and well taken care of, have given excellent results. When in the hands of careless workmen they soon warp, split, and, when not properly cleaned, cause frequent damage to the edge of the green pavement. When placed to accurate grade and alignment they must be thoroughly staked. Using too few stakes is fatal. If these forms are not rigid, waves, bump and depressions inevitably occur in the completed surface.

Once I heard criticism of the large vibratory finishing machines from the standpoint that they impose a larger load upon side forms than was thought advisable. Personally, I do not take it as a criticism of the machine, but rather of the forms. Make them rigid, and the template, properly used, will cut the surface to the desired shape.

Steel forms are coming into general use. It is probable that specifications in the near future will express a decided preference for them. Many contractors, in an effort to save, purchase too light a weight, with the result that they are soon bent, twisted and unfit for use. In spite of preference for steel forms, they are not to be recommended for short, vertical curves or transverse curves of any character. They are too rigid to adapt themselves to the smooth outline necessary in a properly staked curve.

If we are to improve the surface of our concrete roads appreciably, it becomes necessary for the engineer to see that forms are accurately set to grade and alignment and maintained there. They are the only framework possible in a road. They are as essential as the formwork of a building. They are the guide lines of the pavement.

### Templates Need Constant Watching

After the concrete is placed within the forms, it should be struck off with a template having a length slightly greater than the width of the pavement. An excess length of possibly 18 ins. will suffice for average highway work on pavement 15 to 18 ft. in width. This template should be moved by a combined longitudinal and crosswise motion.

Do not make the common error of cutting the arc of the template to the same dimensions as indicated on the cross-section. It should be cut ¼ in. to ⅜ in. deeper than the theoretical crown; otherwise the resulting surface will be flat. This correction should vary to correspond with the width of the pavement as well as general conditions surrounding the job. The amount of water generally employed is a factor, for it is apparent that soft, mushy concrete will flatten out more readily than that containing a lesser amount of water. This template should be shod with a steel edge, using countersunk screws.

Templates may be made from either one or two boards. If two boards are used, they are held apart some distance by small struts. This style insures a more uniform bearing on the forms, but is usually heavy, hard to handle and has a tendency to leave bumps or depressions, as the workmen are reluctant to move it back and restrike the surface.

The writer has seen good results obtained by using a heavy double-edged steel template drawn by a cable, operated by a drum connected with the engine of the mixer. There is a general tendency to supplant man power wherever possible.

In moving the template along the forms, a slight excess of material must be in advance of the cutting edge at all times. Failure to do this will result in depressions or holes. Do not permit the template to ride on stone or gravel on top of side forms. In working on grades even as low as 3 per cent., repeated striking must be done if a smooth surface is to result. The concrete, being plastic and of more or less non-uniform water content, will flow down the grade. This flow is not uniform, but is given to taking the form of alternate humps and depressions, which can only be prevented by repeated and continued striking until initial set takes place. Keeping the amount of water in the mix as low as possible assists materially.

Satisfactory results are obtainable only after pains are taken. The men operating the striker must have an interest in their work or surface defects will occur. Watch the template. Check it up every few days, making sure that it has not warped or gone out of shape.

This matter of crown of pavement was forcefully impressed upon me several years ago, in connection with the construction of my first concrete road. The template used was composed of two striking edges, several inches apart, covered with a plain board on top. At night, after work, it was washed off and placed on the forms behind the mixer. This afforded the night watchman (who, unfortunately for us, was of liberal proportions), or his visitors, a convenient seat. Continued use for this purpose resulted in a reduction in the crown of pavement by aproximately ¾ in. This is no large amount, but it is apparent on pavement designed with a minimum of curvature. Frequently, too, a template, properly designed and cut to the required arc, develops a sag, due to its own weight, when placed in position on the forms. In general, templates—home-made devices especially—are not to be trusted. Good surfaces may be obtained, but it is only by exercising care and judgment that satisfaction is secured.

### Expansion Joints

In the first concrete road construction expansion joints were used in varying designs. Many otherwise good pavements had their riding qualities much impaired by these poorly placed joints. Unfortunately, highway engineers have not yet agreed among themselves as to what device is best suited to serve the purpose. Until standard practice develops some uniformity, we must expect to have continued experiments, with occasional pieces of pavements unsatisfactory.

Generally speaking, any joint or holding device which does not permit the free use of the template is to be condemned. Not that excellent surfaces cannot be secured, but rather that it necessitates special care for the finisher. The elimination of expansion joints altogether, or possible acceptance of blind joints, will do much to improve the riding qualities of our concrete surface.

### Finishing Surfaces as Recently Developed

Naturally enough, concrete pavements were first finished with the same tools as sidewalks or building floors. The public approval of a wood float surface led to the general use of a small wood float, 12 to 18 inches long, operated by hand. It was possible for the contractor, at small cost, to finish by hand in a most satisfactory manner. It was a tiresome job for the finisher,

operating from a cross-plank or bridge. Too frequently the work was intrusted to unskilled men, who probably slighted much of the surface, at the same time probably working holes, depressions or flat places at the more accessible portions of the surface. Many excellent surfaces have been obtained in this manner, but substitution of unskilled labor by the contractor in an effort to effect a small saving, together with the drudgery involved, led to the development of easier and better methods.

Following the hand float came the easier, but unquestionably poorer, experiment of placing a small wood float at the end of a long handle. This being operated from sides of the road, permitted the omission of a bridge. It was applicable to narrow pavements, being used with some success on roads up to 12 feet in width. In general the surface secured was much inferior to the hand method. The central portions of the pavement were neglected, with the result that too frequent evidence of laitance, dirt or surface defects occurred near the center.

Engineers had recognized the importance of keeping the quantity of water required in the mix to a minimum, but under working conditions a small excess had been permitted, for the reason that concrete of proper consistency was difficult to work. Incidentally, the mixer with spout delivery required an excess of water. Several years ago experimenters in the states of Oregon and Michigan perfected mechanical devices for striking, compacting and finishing concrete, but these, while possessing merit, were heavy, costly and unsuited to operation on short, isolated sections.

It is only recently—not farther back than the construction season of 1916—that two simple operations, developed in different parts of this country, have been brought forward, and, when combined, resulted in radical changes in specifications and methods of finishing. I refer to the combined use of roller and belt in finishing concrete surfaces.

To an engineer of Macon, Ga., we are indebted for promoting the use of a small hand roller, some 8 in. in diameter and about 6 ft. long. This was operated transversely across the pavement by a handle. The old adage that "necessity is the mother of invention" certainly holds true in the method developed for smoothing concrete surfaces. It is told that a contractor in Michigan, during the summer of 1916, was inconvenienced by a strike which occurred among his gang after considerable concrete had been placed, struck off, but not finished. It seems that in desperation he ripped strips of canvas from his tent, dragged them over the surface in a desperate attempt to place the concrete in a condition satisfactory to the engineer and prevent possible loss. The results were astonishing, so much so that hand finishing was afterwards dispensed with and a canvas belt substituted.

During the construction season of 1917 the engineering organization of the state of Illinois, Department of Public Works and Buildings, Division of Highways, used their influence with contractors and secured their co-operation in experiment sufficient to warrant the department in incorporating this belt-roller finish in the specifications for concrete highways, edition of March, 1918. These specifications, representing the consensus of opinion of the entire engineering organization, are based upon experience gained throughout the state of Illinois, with different aggregate, different workmen and varying general conditions encountered in actual practice.

Stretch of the Toronto-Hamilton Highway in Massachusetts

### How to Use the Roller and Belt

The entire operation of finishing is specified to consist of three beltings and two rollings, beginning with a belting and alternating until the final belting. The belts are of a canvas or rubber composition, about 2 ft. longer than the width of the povement. This belt also should be fairly heavy, but pliable enough to conform to the crown of the pavement. No irregularities should be permitted in the edges, for these will cause ridges or depressions in the plastic surface. In both the first and second belting, the operation should consist of long, transverse strokes combined with a relatively slow, longitudinal movement. After the second rolling, the concrete is to be given a final finish, just previous to the initial set of the concrete. The time interval between placing the concrete to final finish is variable, depending somewhat upon the amount of water in the mix, but largely on weather conditions. In other words, a highly satisfactory surface can be se-

cured by final belting when the film of surface water has just disappeared. In the last operation a light canvas belt about 6 to 8 inches in width, used with short, transverse strokes, but with a sweeping longitudinal motion, will produce a uniformly gritty surface.

A satisfactory roller may be made with diameter of 2 to 12 inches and a length of 4 to 6 feet, having a total weight of ¾ to 1 pound per linear inch of roller. For roads up to 15 feet in width it may be operated by a long, light handle. Pavement of greater width requires the use of ropes in place of the handle, operated by a man on either side of the pavement. The first belting follows immediately after the strike board, and is in turn followed by the roller. The roller is thus advanced along the length of the road, each unit of surface receiving four separate treatments. A trip over in the manner described constitutes a rolling.

The surface should again be belted, and, after a lapse of 15 to 20 minutes, again rolled. This time limit must be somewhat variable and left to the option of the resident engineer. Very wet mixing or cool weather encountered may make it desirable to recommend an additional rolling before final belting. In explanation of the foregoing ideas incorporated in specifications, a word of caution in regard to belting is necessary. The first belting is done to smooth up the surface only, surface water in advance of the roller.

In general, belting should be a minimum, for continued working of the surface results in an excess of mortar. Present practice favors the wear coming upon the large aggregate, with only enough mortar present to bond the stones securely and prevent voids.

Possibly the foregoing description of finishing may seem complicated, but in reality the physical labor involved is relatively small—much less than required in the old wooden float method. The cost per unit of surface is materially reduced. Surface imperfections are a minimum. The roller eliminates many bumps, by pushing them into the depressions or placing them parallel to the line of traffic, where they are unnoticed. Each unit of area receives the same amount of attention, and in the end a uniformly gritty surface is obtained, far surpassing in texture, uniformity and riding qualities the original hand methods.

Roads constructed by roller method have shown an apparent reduction in the transverse cracks. Later uncompleted experiments in laboratory tests reveal the fact that with the rolling and removal of water comes an increase in concrete strength.

In mentioning the recent developments of surface finishing it should not be assumed that the roller-belt method represents conditions that cannot be improved upon. For simplicity and low cost of operation it is at present unequaled and its use is to be recommended in the construction of small, widely separated sections of work. It appears probable that future developments in concrete pavements will have largely in mind the proportioning of aggregate so as to produce the greatest possible strength. In connection there will come equipment which by rolling, tamping or otherwise will increase the density and strength, at the same time securing all the advantages of a roller-belt finish.

## Methods and Cost of Constructing Concrete Lined Oil-Storage Reservoirs

The U. S. Bureau of Mines has been conducting investigations with the view of determining the types of containers best adapted to the storage of oil. The results of the study are given in Bulletin 155, prepared by Mr. C. P. Bowie and issued recently by the Bureau. The matter in this article is abstracted from the above mentioned publication. The investigations showed that tanks composed wholly of steel give the best results, but where larger containers than it is possible to build with steel are desired concrete lined reservoirs can be recommended for some grades of oils. Most of the concrete lined reservoirs in use in the United States are to be found in California. In that state there are an aggregate of 29 such reservoirs, having a total capacity of nearly 19,000,000 bbl. They are situated either in the oil fields or at various points along the coast, and are used exclusively for fuel oils varying in gravity from 14° to 18° B. The lighter refining crudes are without execption stored in steel tanks.

The reservoirs are commonly circular in plan, and are constructed by making an excavation and building an earthen embankment with the excavated material. The area within the inner crest of the embankment is then covered with a wooden roof and the bottom and sides of the inclosed place lined with concrete.

Extracts from a typical specification for this class of containers are given below. The dimensions of this container are as follows: Inside diameter at top, 488 ft.; inside diameter at bottom, 437 ft. 6 in.; maximum depth, approximately 25 ft. 11 in. The slopes of the embankment are: Slope of embankment inside reservoir, 1 to 1; slope of embankment outside reservoir, 2 to 1; slope of embankment top of reservoir, 20 to 1. The width of the embankment on top is 15 ft. The roof is constructed of wood, covered with roofing paper.

Stripping the Surface Soil.—The contractor shall first strip the entire site of the reservoir, both that portion in cut and that portion to be covered by embankment, of all vegetable matter and top soil. This stripping shall extend to a depth of at least 8 in. below the surface and to whatever greater depth may in the judgment of the company be required. The material so stripped shall be removed from the area and placed in fire levees surrounding the reservoir site, or at

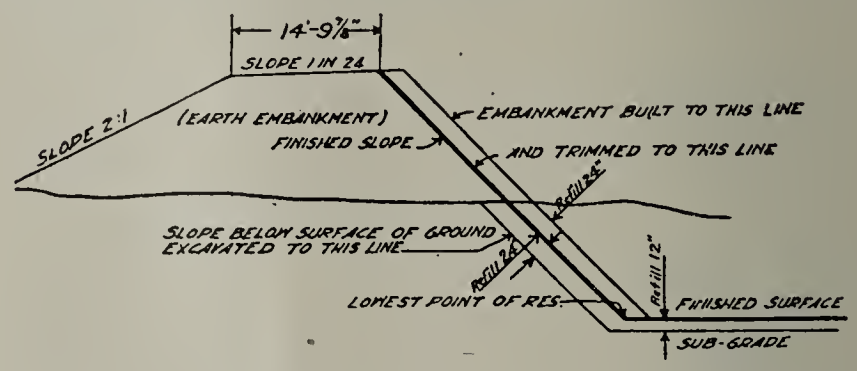


Diagram Showing Construction of Floor and Embankment.

other points in the vicinity of the reservoir, as directed by the company.

Oil and Water Drains.—Two 12-in. oil lines and one 8-in. water drain shall be placed beneath the embankment, at such positions as shall be designated by the company.

Building Up the Embankment.—The area beneath the embankment shall be plowed by the contractor, thoroughly harrowed, and moistened with water to the satisfaction of the company. The embankment shall then be built with material excavated from within the reservoir, or, if need be, from pits in the vicinity of the reservoir. The material may be excavated and placed in the embankment by wheel scrapers, "fresno" scrapers or wagons. It shall, however, not be deposited in layers more than 3 in. thick, and where necessary road machines shall be employed to insure the proper spreading of the material in the embankment. Under no conditions shall material be dumped onto the embankment in a pile and not spread.

All material placed in the embankment shall be moistened with water before being loaded into the scrapers or wagons, and shall again be moistened after having been spread.

When the material has been placed in thin layers in the embankment and moistened as specified, it shall then be tamped by at least two roller tampers of the sheep's foot type. Each tamper shall be drawn by a 4-horse team, and shall be driven around the top of the fill, making at least 10 complete circuits of the reservoir per hour.

Runways to Embankment.—In the construction of the embankment the contractor shall build runways for the removal of the material from the excavation inside the reservoir to the embankment. These runways shall be located by the company, and shall be spaced at a distance not less than 100 ft. apart. The scrapers, wagons, teams, etc., in carrying the dirt from the excavation to the embankment shall be driven up one runway and shall return to the excavation along the top of the embankment and down the next adjacent runway.

The Inside Slope.—The excavation shall be so made that the inner slope shall be about the width of a wheel scraper beyond the line of the desired finished slope, beginning at the bottom of the reservoir, which shall be excavated for a distance of about 1 ft. below the position of the concrete lining. The inner slope shall then be built up by material excavated from within the reservoir, deposited by wheel scrapers in thin horizontal layers, and shall be moistened and thoroughly tamped by the sheep's foot tampers. This inner embankment, or earthen lining, shall be bound to the original embankment and slope by first plowing or otherwise roughening the original slope and embankment. When this lining is thus built up it shall be allowed to stand for at least 3 days before being trimmed to grade. The inner face of the embankment so built up shall then be trimmed to a true and even slope to conform with the dimensions of the reservoir as herein set forth.

Top of the Embankment.—The top of the embankment shall be built at least 2 in. higher than the finished top, and shall be made smooth and even and brought to proper grade.

Outside Slope.—The outside slope of the embankment shall be 2 horiontal to 1 vertical. It shall be built up compactly, and neatly finished, and upon completion shall be oiled by the contractor for a distance of 3 ft. beyond the toe of the embankment.

Bottom of Reservoir.—The bottom of the reservoir shall be excavated to a subgrade 1 ft. below the finished grade. It shall then be thoroughly plowed, harrowed, moistened and compacted. Suitable refilling material shall then be spread over it to bring it up to the finished grade. The refilling material shall be spread on in thin layers as specified for the embankment, and shall be thoroughly moistened and rolled. The roller used on this work shall have a smooth surface, and shall weigh no less than 5 tons.

Excavation for Post Footings and Swing-pipe Pit.—When the bottom of the reservoir has been brought to the proper grade, the contractor shall make excavations for the concrete footings for the posts, for the swing-pipe pit, and for the joint between the floor and the side slabs as designated by the company.

Concrete.—The work to be done by the contractor under this section consists of constructing upon the sides and bottom of the reservoir, in a thoroughly workmanlike manner, a lining of concrete 3 in. in thickness, reinforced with metallic fabric as hereinafter specified, and so carefully poured and compacted as to be as nearly as possible water-tight. Under no condition shall any of the concrete for the sides or floor be poured until the framework and sheathing of the roof, with the exception of the 10-ft. strip around the circumference of the reservoir as hereinabove specified, shall have been erected. The piers for roof supports must, of course, be constructed before the erection of the roof.

Reinforcing Material.—The reinforcing material used in the bottom and on the sides of the tank shall be welded metal fabric, having a 4-in.-by-4-in. mesh, and composed of No. 6 gage wires both ways. This fabric shall be furnished in rolls 86 in. in width and approximately 240 ft. long.

Placing Reinforcement.—All reinforcement fabric for the bottom of the reservoir shall be laid before the roof is put in place, and must extend continuously along the bottom and sides of the reservoir through the foundation piers for the posts. Longitudinal splices shall be lapped at least one mesh and shall be wired together with No. 16 gage annealed iron wire to be furnished by the contractor. All reinforcement must be properly stretched and made to lie flat. Transverse splices in reinforcement shall lap 24 in.

Joint at Toe of Slope.—A wooden joint of 1-by-6-in. material shall be placed in the concrete at the toe of the slope inside the reservoir. The metal fabric laid upon the slopes and the bottom of the reservoir shall pass through the wooden frame in the joint, and shall be so laid as to form a continuous reinforcement, tying sides and bottom together.

Proportioning Concrete Material.—The concrete for the bottom of the reservoir and for the piers supporting the roof shall be composed of 1 part of Portland cement, 2½ parts of sand, 2 parts of ½-in. crushed rock, and 2½ parts of 1-in. crushed rock. The concrete for the sides of the reservoir shall be composed of 1 part of Portland cement, 2½ parts of sand, and 2 parts of ½-in. crushed rock.

Mixing and Pouring Concrete.—The bottom of the reservoir and the side slopes shall be thoroughly wetted before any concrete material is poured on them. * * * * On both the floor and the side slopes a layer of concrete approximately 1½ in. thick shall first be poured. The reinforcing fabric shall then be drawn up through the concrete and allowed to rest on top of it. As soon as the fabric has been drawn up, and before the first layer of concrete shall have obtained its initial set, a second layer shall be immediately poured, bringing the slab up to the required thickness. When the pouring has been completed, the surface of the concrete must be immediately tamped with wooden tampers and then finished smooth and close-grained by troweling. The contractor must at all times exercise especial care that the position of the wire fabric is as nearly as possible in the center of the slab.

**General Details Regarding Reservoir Construction**

Choice of Site for Reservoir.—One of the most important factors upon which the success of a reservoir depends is the judicious choice of the site. The soil should be of homogeneous texture, preferably a sandy clay in which clay predominates. The site should be well drained in order that any surface waters that may percolate through the embankment and get behind the concrete lining may be carried away and not allowed to stand. It has been suggested that in large reservoirs drain tiles insuring the prompt removal of surface water might well be placed beneath the excavation. No site should be chosen such that the level of adjacent standing water, such as backwater from the arm of a river or bay, will at any time be above the level of the bottom of the completed reservoir. When strata or pockets of sand or other loose material extending into the subgrade are encountered they should invariably be removed for a distance of 3 ft. or more

below the finished excavation and then refilled to grade with selected earth, put on in thin layers and carefully tamped.

Building Embankment.—In building up the embankment the "sheep's foot" type of roller tamper has proved most effective. A "road machine" or road grader has been successfully used by some contractors for spreading the material, and a heavy harrow or a drag scraper has been used for breaking clods.

Wetting down the loose material is effective in enabling the tampers to build a compact embankment, in making the earth ride satisfactorily in the scrapers and in keeping down the dust. The usual method of sprinkling is by a hose.

On completion of the main embankment and the refill on the inner slope it is necessary to trim from the inner slope a foot or more of material to bring it to the true grade and to prepare it for the concrete lining. Grade stakes are set on radial lines at the top and the inner toe of the slope at distances of approximately 10 ft. apart around the circumference of the reservoir. Narrow trenches about 6 in. wide are then dug to grade by the use of mattocks and slope-level boards and 2-in. by 4-in. strips 38 ft. long placed flat against the finished surface. The trimming between these slope strips is then done by hand or by especially devised scrapers.

Outside Slope.—The outside slope of the embankment when finished should be thoroughly sprinkled with oil, which not only prevents the washing of the earth by heavy rains but retards the growth of grass and weeds which when dry become a serious fire menace. It is good practice when the reservoir is in use to oil the slope two or three times a year, or often enough to keep it free from vegetation. A rapid and successful means of oiling is as follows: An ordinary 500-gal. tank wagon is arranged with a sprinkler spout having an extended arm on one side so that the outer perforations will deliver the oil well toward the toe of the embankment. The lower part of the slope is reached from the ground surface.

### Cost of Reservoirs

The cost of a reservoir such as covered by the foregoing specifications would be 10 to 13 ct. per barrel of capacity, dependent on the situation and other governing conditions. On a basis of 11 ct., the cost would be distributed approximately as follows:

| | |
|---|---|
| Cost of earthwork, ct. | 3.5 |
| Cost of roof, ct. | 3.0 |
| Cost of concrete lining, ct. | 4.5 |
| Total, ct. | 11.0 |

An unlined earthen reservoir with the same type of roof construction would cost 7 to 9½ ct. a barrel, and it is estimated that a concrete lined reservoir with a concrete roof on concrete roof supports and covered with 2 ft. of earth would cost about 30 ct. a barrel.

The following figures for labor costs cover the construction of two 750,000-bbl. reinforced concrete lined reservoirs built at Bakersfield, Cal., during the winter and spring of 1913-14:

| | |
|---|---|
| Earthwork: | |
| Excavating for embankment, per yd. | $0.22 |
| Lining inner slopes with selected material, per yd. | .51 |
| Finishing floor, per sq. ft. | .005 |
| Excavating for pier footings, trenches, etc., per yd. | .70 |
| Trimming slopes, per sq. ft. | .012 |
| Roof: | |
| Hauling lumber from cars (½ mile), per M. | 1.19 |
| Framing lumber for roof, per M. | 1.60 |
| Erecting roof, per M. | 3.80 |
| Sawing sheathing, per M. | 1.35 |
| Roofing: | |
| Laying roofing paper, per square | .12 |
| Hauling roofing gravel from cars (½ mile), per ton | .25 |
| Placing asphalt and gravel coating, per square | .32 |
| Concrete lining: | |
| Hauling cement from cars (½ mile), per ton. | .54 |
| Hauling sand from creek bed (2 miles), per yard | .86 |
| Hauling rock (½ mile from cars), per yd. | .50 |
| Laying reinforcing metal on slope, per sq. | .16 |
| Laying reinforcing metal on floor, per sq. | .08 |
| Pouring concrete piers, per yd. | *4.63 |
| Pouring concrete floors, per yd. | *2.51 |
| Pouring concrete slope, per yd. | *3.46 |

*Including cost of rock, at $1.60 per ton. All material except sand and gravel was furnished by the owner at the Southern Pacific R. R. ½ mile distant from the work.

The figures given are based on the following conditions:

Situation of reservoir, ½ mile from railroad.
Formation of soil, light sandy clay.
Excavators used, wheel and "fresno" scrapers.
Hours worked a day, 9.
Wage paid laborers, $2.50 a day.
Wage paid carpenters, $3.50 a day.
Wage paid concrete laborers, $2.75 a day.
Wage paid concrete finishers, $4.50 a day.
Wage paid foremen, $6 a day.

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## Concrete Posts

One of the busiest of Madison's (Wis.) industries is the plant of the Madison Concrete Products Company. Seven men are kept busy every minute of the day making concrete posts to fill the large orders which are daily received from county commissioners throughout the state. The posts are to be used for markers on either side of every railway crossing.

Models of this post, as made in one of the latest types of post machines turned out from the ships of the National Concrete Machinery Company of this city, were taken before the State Highway Commission and approved for use by county commissioners throughout the state. Orders for 1,800 have been received from these commissioners and many are still to be heard from.

The machine which makes these posts is the most interesting piece of machinery in the factory. The sand and cement is automatically fed into the carrier, which dumps it into a mixer, suspended over the post molds. The molds are prepared previous to being placed beneath the mixer by inserting six Bessemer steel rods in circular shape in the center of the mold. An automatic Josling device keeps the reinforcement one half-inch from the outer surface, insuring a post, after several weeks of curing, an everlasting life, because of its even strength.

The Highway Commission is furnishing county commissioners metal signs carrying the letters "R. R." which are fastened to the tops of the posts, and it is planned to use the sign exclusively for this sort of trail marker throughout the state. Several other states are planning its adoption.

Other products turned out by the Madison Concrete Products Company are concrete building blocks, concrete silo blocks, burial vaults, concrete brick and arrangements are being made to turn out in the near future concrete drainage tile.

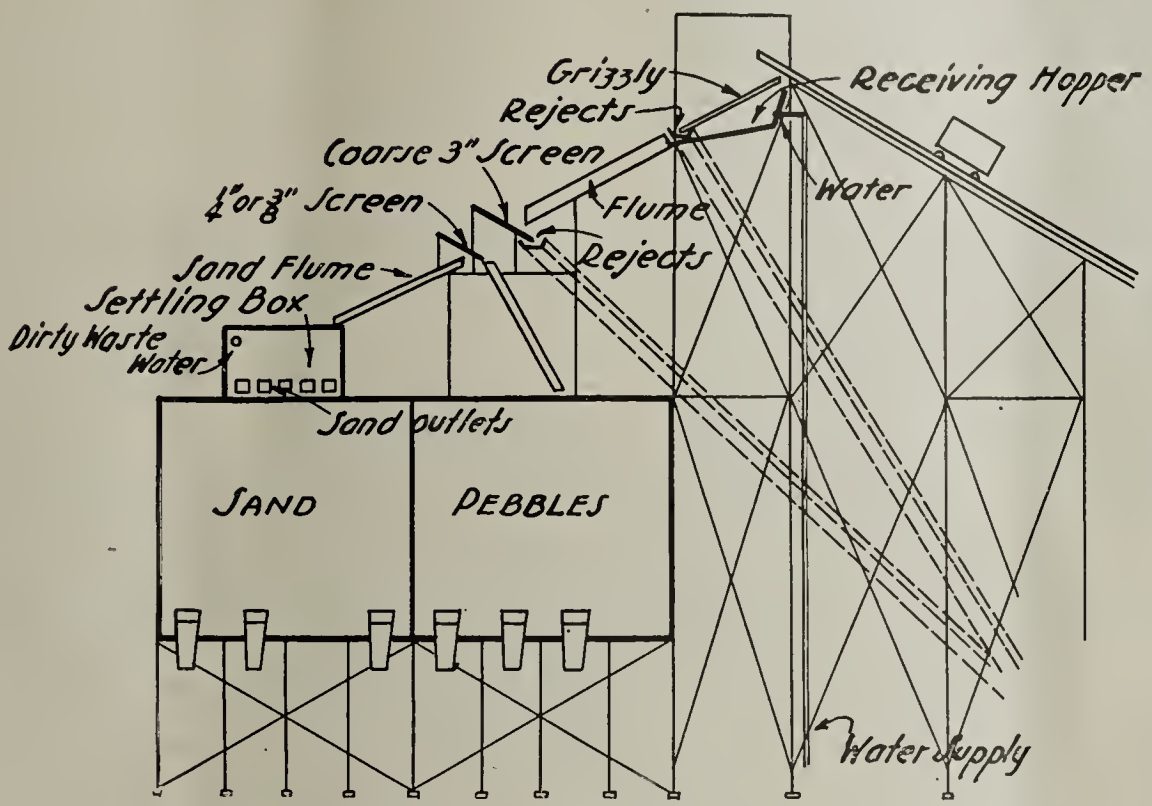
Urban J. Meuer, general manager, is in active charge of the plant.

# Clean Aggregates Obtained Under Difficult Conditions

By C. P. Mowry

Office Assistant, County Engineer, Seattle, Wash.

Permanent Highway 11-b, King County, Wash., for which the Kaiser Paving Co., of Everett, Wash., has the contract, is 6.22 miles long and crosses a gravelly plateau region at an elevation of about 600 feet above sea level. The pavement is 20 feet wide, 8 inches thick at center and 6 inches at sides, construction being one-course, using 1:2:3 concrete. The total job measures about 73,000 square yards and the work will use about 7,100 cubic yards of sand and 10,500 cubic yards of pebbles.




Sketch showing general arrangement and working of plant.

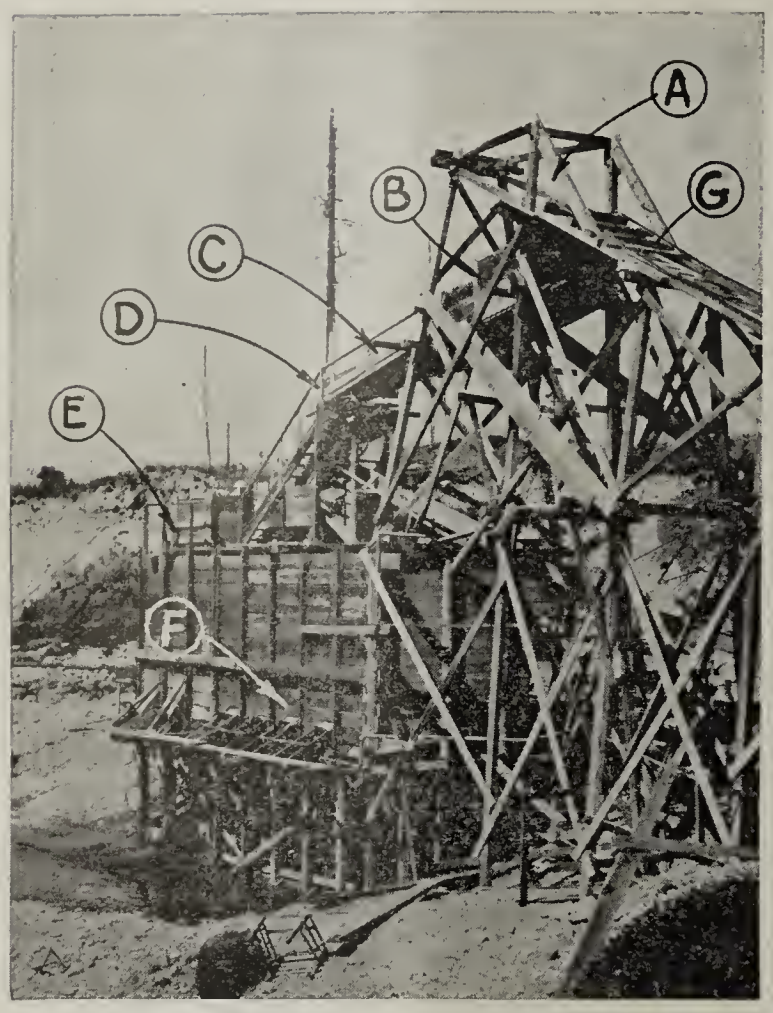
Even before the contract for this work was let, it was realized that the most difficult feature would be to secure suitable aggregates. In this locality, summer rainfall is light and surface water supply scant. Frequently when a suitable gravel pit is located, sufficient water for the job's requirements is not available within a distance of several miles. Practically the only place where gravel was found reasonably close to a suitable water supply for washing was so far away from the work that the cost of transportation was prohibitive, and this fact limited the number of bids received upon the work.

The pit which was finally decided upon to furnish aggregates lies near the right of way of the road about midway of the contract, but the nearest water supply is 1½ miles away and approximately 100 feet lower in elevation than the pit. Here the pumping plant was located, which consists of one 4 by 4-inch triplex pump with 2½-inch suction, one 3 by 4-inch duplex with 2-inch suction, driven by two 6-horsepower gas engines and discharging into a force main about 1½ miles long, of which about 1,000 feet is 6-inch wood stave pipe, the remainder being 4-inch wood stave pipe. The combined delivery of these pumps is stated to be approximately 50 gallons per minute, working against a head of 90 pounds per square inch at the bunker end. The main discharge is used first to obtain clear water under pressure for the final washing, surplus being discharged into a clear water reservoir.

The principal equipment at the gravel pit consists of a drag line scraper of 1 cubic yard capacity, operated by a 7 by 10¼-inch double drum hoist, a 1-cubic-yard skip, a pebble and sand bunker having a capacity of 90 cubic yards of pebbles and 30 cubic yards of sand, a timber settling basin for dirty water about 20 by 30 feet and 3 feet dep, with an 80-foot settling flume 2 feet wide carrying 8 inches of water passing over several timber catch basins. There is also a gasoline pump located near the bunkers to pump water from the settling basin to the first washing flume of the plant, and a clear water reservoir located on the plant above the pebble bunker and receiving clear water from the pumping plant. This reservoir has a capacity of about 13,000 gallons.

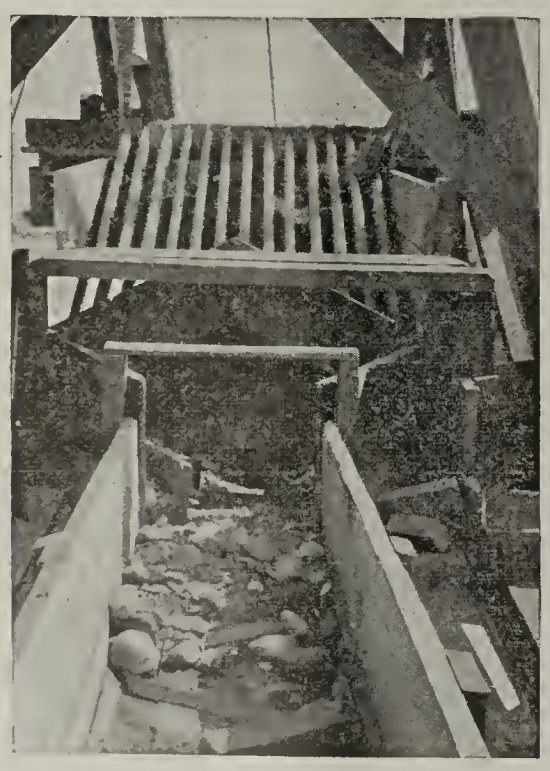
Materials are excavated by means of the drag line scraper and deposited upon a timber trap built over the lower end of the incline carrying the skip. The skip hoist conveys material to a grizzly at the head of the washing plant located above the pebble bunkers, where over-sized material is separated and returned to the waste dump. The first washing is given at the grizzly by a stream of water amounting to 200 gallons per minute, pumped from the settling tank by a 10-horsepower engine under heavy pressure, washing materials along a flume about 16 feet long, 2 feet wide and 18 inches deep, at the bottom of which riffles are placed. At the lower end of the flume, pebbles are discharged upon a coarse screen which is backed by a screen of ¼-inch mesh, set about 6 inches behind. Sand mixed with the pebbles passes with the washing water through the fine screen directly into the sand washing box, while the pebbles are directed through a chute into their bunker. As the pebbles pass down along the fine screen, they encounter a series of powerful jets of clean water coming from a 2-inch pipe drilled with small holes and receiving the water supply directly from the force main leading from the pump located at the pumping plant. These jets retard the movement of the pebbles appreciably and thoroughly wash from them any organic matter or clay which may have remained adherent after having passed the first flume.

The sand box is shaped somewhat like a small bunker and has a sloping floor. It is 4½ feet square, 5 feet high and is pivoted upon a heavy piece of pipe as an axle, with a counterweight consisting of a box filled with large stone. Near the bottom of the front vertical face are two short sections of 3-inch pipe attached to a timber box by means of standard flanges. The outer ends of short pipe, when the sand box is empty, bear against leather washers attached to the timbers,




A—First washing; water supply 200 gallons per minute at this point. B—Rejections from Grizzly. C—Flume and riffles. D—Screen separates sand from pebbles. E—Sand washing box. F. Pebble bins; pebbles receive final washing here. G—Skip hoist.

which serve as stoppers. The principle of the sand box is that when filled with water, but containing no sand, the counterbalance holds the box in position and the pipes bearing against the timber prevent outflow of material. When sand accumulates in the box to a convenient depth, which may be regulated by stones



Receiving hopper, elevator discharge and upper end of riffle.

in the counterweight, the box automatically tilts downward, moving the outlet pipe below the lower level of the timber, permitting accumulated sand to flow into the sand bunkers.

Close to the bottom of the tipple box there is another section of pipe, drilled with holes, pointing upward, through which jets of clean water are continually forced under high pressure, which further cleans the sand. The overflow from the sand box is conveyed to the settling flume and tank, where it is allowed to clear before again used. As a final precaution to securing clean material, outlet chutes from the pebble bunkers have floors of ¼-inch mesh screen and directly above the chutes is another series of 2-inch pipe, drilled with holes, to direct jets of clean water downward through the pebbles as drawn into motor trucks.

Since the development of the plant as described, samples of the material submitted to the colorimetric test show practically a clear liquid, and standard briquets made with a mixture of 1 part cement to 3 of sand show an average tensile strength for 7 days of 292 pounds per square inch, while the same cement used with standard Ottawa sand showed 251 pounds at 7 days.

Much credit is due Henry J. Kaiser, president of the contracting company, for the skill displayed in working out problems involved in this plant.

## Drainage, Irrigation and the Use of Better Farming Methods Would Double the Crops of the Mississippi Valley

Luther Burbank has just announced the production of a new species of wheat that will yield 50 bushels to the acre where 12 is now the average. When we speak of the practicability of doubling the crops in the Mississippi Valley, we do not refer to the use of new varieties of plants, such as the wizard Burbank has "invented," but the use of well-known agricultural methods and the application of civil engineering.

Lack of knowledge, lack of capital, and lack of engineering constitute the triumvirate of obstacles to greatly increased agricultural output. In spite of all that the Department of Agriculture, the agricultural colleges, and the farm papers have done, the average farmer remains largely ignorant of the most economic procedure. This very ignorance stands in the way of his seeking the capital that he could profitably employ, and it deters him also from seeking engineering assistance.

It would seem that here, if anywhere, a paternalistic government would be efficient. Such a government would not merely tell farmers what should be done, but it would insist upon their doing it.

Drainage and irrigation would alone nearly double the productivity of Mississippi Valley lands, as has been established again and again on a large scale. Practically all this land is greatly benefited by tile drainage, to say nothing of the drainage of swamp lands. Irrigation by pumping is practicable for most of this land, and it not only insures against crop failure but adds greatly to the annual crop yield.

There are about 80,000,000 acres of swamp and overflow land in America that can be reclaimed; but at the rate of reclamation that has existed in recent years, another half century will have elapsed before it will have been reclaimed.

The Department of Agriculture estimates that about 150,000,000 acres, or nearly one-third of all improved farm land, is so badly in need of tile drainage that it is producing only one-fifth as much as it would produce if drained. Yet less than a million acres of the 150,000,000 are annually improved by tile drainage!

Drainage and irrigation are civil engineering works, and it seems to us to be the duty of civil engineering societies to take steps that will lead to government action designed to hasten the rescue of 200,000,000 acres of tillable land—nearly all in the Mississippi Valley—from its present condition of inefficiency.
[*Engineering & Contracting.*]

# Standardization of Detail in Highway Bridge Design

By M. W. Torkelson

Bridge Engineer, Wisconsin Highway Commission,
Madison, Wisconsin

It is not common for the plans of an important structure designed to meet certain conditions at one location, to be used a second time with but little change. The bridge which is shown in the accompanying illustration was, however, built from the same plan which was originally worked out in detail by the Wisconsin Highway Commission for first use at Branch, Manitowoc County, Wis. The only variation necessary to adapt the plans for another site in Langlade County was to increase the length of the piles driven under the foundation.

In addition to its standard designs, which number about 200, the Wisconsin Highway Commission has prepared approximately 2,600 special bridge designs which range from the simplest abutment plan to highly complex reinforced concrete arch and girder designs. All of these special designs are worked out in very complete detail and records are carefully kept indexed by type and dimensions, so that when need arises for any particular kind of bridge it is a simple matter to select a plan most nearly fitting the structure needed. Sometimes very simple alterations which can be shown on the blueprints will make the old plans serve. Generally new drawings must be made so that there will be no misunderstanding about what is included in any particular contract, but with the old plans to serve as a guide, the work is greatly facilitated. Often a new design is made by utilizing portions of several previous plans, which may vary widely but which nevertheless contain the elements used in the proposed new structure. The practice followed is illustrated by the following example:

Recently one of our counties decided to build a bridge consisting of a steel span of 80 feet over the main stream channel with three 30-foot reinforced concrete spans at one end and one 30-foot reinforced concrete span at the other. Arrangements had been made for immediate construction. The builder was on the ground and plans were desired with the least possible delay.

The design was most unusual and an individual plan absolutely necessary, but as the builder was ready to proceed, a search was made through designs already on hand to see what could be adapted to the new work. An abutment plan was found which fitted exactly and a superstructure plan which showed every bar required in the superstructure detail, the only change necessary being that the bill of bars was doubled. The prints of these old drawings together with a hastily drawn layout sketch and some written instructions were forwarded to the builder in the same day's mail, thus enabling him to at once begin work on the abutments and to order steel reinforcement for the superstructure, which required accurate shop bending. The 80-foot steel span had already been ordered, the Commission's standard design being used.

The situation required piers of simple yet special design. Plans were made within two days and placed in the builder's hands. He was then in possession of a complete bill of all material, including details of all bars and the working plan within three days after the time our office was advised the work was under way. Abutment and superstructure plans were then redrawn for the particular case at hand and the individual plans and specifications made up. The design of the superstructure and abutments was simple, the greater portion of the work being mere tracing.

**The Ryzula bridge, Town of Ackly, Langlade County, Wisconsin. The stream will be straightened to flow under the bridge.**

During June and July, 1918, the Commission designed and furnished complete plans and specifications in sets of four for 152 bridges averaging about three complete designs per day. Each design is made to fit the particular site where it is to be built. Quantities are calculated and details of each bar shown on the plans so that the complete bill of bars can be purchased, bent in a shop to an accurate template.

The force by which this was accomplished under the writer's direction consists of an assistant, three draftsmen and a stenographer. While a number of the plans were standard designs requiring only slight adjustment, there was a considerable number of important special jobs. One in particular involved an unusual amount of new work and kept our best draftsman completely occupied for three weeks.

It is the practice, when any new feature is introduced, to work out all details with utmost completeness. When this feature is used on another job, the new design is a very simple matter. This practice, together with the complete record of the details of work already turned out, makes possible our large output.

Great care must be taken, however, in determining the extent to which standardization shall be carried. Undeviating adherence to standard designs often produces poor results, considered both from the standpoint of design and from the standpoint of economy. Proper design requires consideration of the needs of each location and proper provision therefore, even in a country bridge. It has been suggested that a concrete pile trestle will serve for all locations, the only variations being in length and width of tres tle and length of piles, but this is as absurd as it would be to expect one style of garment to fit all figures, the only alteration being in the amount of cloth. There must be individual design, and the methods briefly described above are effective in producing it at low cost.

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# Road Finisher Produces Denser Concrete

### Rapid Agitation of Aggregate Makes Possible the Use of Unusually Dry Mixture

A concrete road finishing machine that eliminates the voids in concrete and by the use of which the proportion of coarse aggregate may be increased considerably is the newest addition to the Lakewood Engineering Company's complete line of road building plant.

The device moves forward under its own power at a speed of about 7 feet per minute and backs up at a speed of 28 feet per minute. As the machine travels forward the strike-off spreads the concrete to the necessary height and proper crown. The tamper, located just back of the strike-off, tamps the concrete the first time over with a long hard stroke. The second time over a short, rapid, up-and-down movement is used, which may be decreased until it is subjecting the concrete to continuous agitation without applying pressure to the mixture. The stroke of the tamper is regulated by the operator and may be varied for different consistencies of concrete as well as for different stages of progress. The float, located at the rear of the machine, produces a smooth finish by sweeping a belt across the surface at a comparatively slow speed.

By subjecting the mixture to the continuous agitation caused by the tamper, the concrete is compacted and the air in it is brought to the surface. The larger stones and only enough mortar to cement them are brought together. Because of the agitating action of the tamper, a drier mixture can be used with the Lakewood finisher than would be possible where the work is done by hand.

This, of course, results in a stronger concrete and produces a surface free from laitance, silt and light particles which float to the surface of a wet mixture.

The views show the Lakewood Concrete Road Finisher in use on the 15-foot Belleville (Ill.) Scott Field road in St. Clair county, where its use has been attracting considerable attention from engineers and contractors. On this work a 1-2-3½ mixture is being used.

The Lakewood Concrete Road Finishing Machine permits the use of a drier, coarser mixture than could be worked by hand.

The device was designed in 1913 by Mr. E. G. Carr, while a contractor in California. This type of machine has been used on the construction of about 400 miles of California's famous highways.

With the assistance of the staff of the Lakewood Engineering Company, Cleveland, the mechanical details have been refined so that the present product is a highly efficient contribution to the building of better concrete roads.

The Belleville job is being done by Keeley Brothers, of East St. Louis. D. O. Thomas is County Highway Engineer and Frank Sheetz is engineer in charge of the work. The concrete road will be 6 miles long, 15 feet wide, 6 inches on the sides and 7½ inches thick at the center.

Views of the Lakewood Concrete Road Finisher in use on the Belleville-Shiloh road in St. Clair County, Ill.

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W. J. Armstrong, manager of the crushing and pulverizing sales department of the Jeffrey Manufacturing Co., Columbus, Ohio, has recently received an appointment as captain in the U. S. Army and assigned to the Ordnance Department in Washington, D. C.

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The Bethlehem Steel Co., Steelton, Pa., set off its largest blast in the history of the local quarries August 26. About 150,000 tons of stone were produced, a supply estimated to be sufficient for the company's steel plant up to the first of the year. About 34 tons of blasing powder were used in 81 holes, under the direction of Superintendent Muth of the Bethlehem quarries.

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The Traylor Engineering and Manufacturing Co., Allentown, Pa., has opened a Los Angeles, Cal., branch. H. V. Croll is manager and his address is 900 Citizens' Bank Building. A Spokane, Wash., branch has also been opened with G. Agens as district manager. His office is 612 Mohawk Building.

# Resurfacing Part of Buffalo-Albany Turnpike with Concrete

By A. S. Hinman

At present the state-highway between Canandaigua and Geneva, N. Y., which is part of the Buffalo-Albany Turnpike, is being resurfaced with concrete.

This road is one of the earliest State roads built in New York. Originally it was waterbound macadam but has been resurfaced several times. In the fall of 1917 the surface was all of bituminous macadam except for the brick pavement which extends about four miles east of Canandaigua. The rough places were resurfaced in 1917 with a 2½-inch bituminous macadam top, so that by the end of that year the road was in excellent condition.

In the spring of 1918, however, large convoys of army and commercial trucks soon changed these conditions. Many places were rendered impassable and it was necessary to throw in cobblestone and crushed stone to keep the road open to the public. Many places which had been reinforced with subbase were as bad as the rest.

**Little inconvenience has been caused either to traffic or to contractor by the methods of carrying on the work of this resurfacing job.**

Some more nearly permanent pavement had to be provided. It was decided to resurface the bad places with concrete. Perhaps one of the deciding factors for concrete aside from its durability was that traffic had to be maintained, particularly because of the commercial use of this road. There is no parallel road to which traffic could be diverted during construction that could stand the heavy trucking, especially in wet weather. It was believed that a concrete pavement could be built more easily and with better results than any other type.

The pavement is 18 feet wide, 8 inches thick in the center and 6 inches at the sides, and of 1:1½:3 mix. Nine feet, or one-half of the pavement, is built at a time, traffic using the other half. The center joint is broken by a 2-inch triangular offset in the center of the form. A parabolic crown is used with a 2-inch rise in the center. Expansion joints are placed every 30 feet, the joints being broken when coming back on the opposite side of the road. Stone is furnished by the General Crushed Stone Co.; sand by the Niagara River Sand & Gravel Company.

The original surfacing averaged 15 feet wide, and about 2½ feet of shoulder on each side had been used by traffic. This gives an available roadway of 20 feet. The old surfacing is first spiked up, then all loose material scraped with a road grader from the center to the outer edges of the roadway, leaving the flat subgrade required. This is thoroughly rolled, traffic being allowed to pass all the time.

One-half of the road is then fine-graded for a short distance ahead of the forms, enough to accommodate the dumping of materials. The stone is placed in the center between the forms, sand in places which are leveled off on the shoulder outside the forms, and cement piled in one row on the outside of the center form, the extra quantity required being placed on top.

**Concrete being laid on one-half of the road without closing to traffic.**

A mixer with 20-foot boom is used running a two-bag batch. A heavy screed, 6 inches wide, follows the mixer. A man working from a bridge with a wooden float 18 inches square, goes over the entire surface. The daily run varies from 500 to 750 lineal feet of pavement 9 feet wide.

The width of roadway available for traffic on one side is from 10 to 11 feet. When driving on the finished side of the pavement this width is obtained by throwing up a temporary shoulder. On stretches

**Stretches of the road were like this before resurfacing with concrete.**

of any length, by-passes are built every three or four hundred feet where convenient by widening the shoulder.

The principal delays to traffic are caused by the unloading of the cement truck, which takes only a few minutes, or getting behind a stone or sand wagon

when hauling along the road where one side has been built. This is only until the nearest by-pass is reached. Also, some autoists will cause delay by running beyond a by-pass when meeting another machine.

At the time of writing (August, 1918), over half the contract is complete and several full-width stretches have been opened to traffic. Numbers of autoists who have been asked how they like the concrete, say, "Fine, but not enough of it."

Interstate truck lines and army trucks in convoys of 30 to 70 and automobiles of all makes are driven from factory to retailer over this road. There is also heavy tourist and local traffic which is to be expected in a thickly populated and wealthy state, and it is surprising how little delay has been caused to traffic and how little the contractor has been inconvenienced by that traffic. The results amply justify the selection of concrete. It is believed that this type of road and method of construction, with perhaps a traffic officer to direct and control traffic, will be a great aid in solving similar resurfacing work.

## Forms for Concrete Building Construction

**From an article by Allan Graham in The Surveyor and Municipal and County Engineer**

The design of the form is usually left to the contractor, but the author believes that for efficiency as well as for his own protection, the engineer should set out some typical portion of the forms for the contractor's guidance.

It is not merely that a design is required for a specific case to support safely a certain volume of concrete, it is rather the problem of designing a set of forms which can be erected, taken down and many times re-used during the progress of the work.

A careful consideration of the type of centering, the kind of timber, how much to center at one time, and what clamps, bolts, nails, wire or strap steel should be used, will repay the trouble taken and result in better and more economical work.

Authorities place the cost of form work at anywhere from 20 per cent to 60 per cent of the total cost, so the chance of reducing this hindrance to the more general use of concrete ought to be closely considered. American construction firms have tried in many ways to reduce this cost, and to this end the forms are designed in the drawing office at a cost of 2 per cent and a saving of 10 per cent.

The author dwells upon the desirability of careful checking of measurements, to see that the concrete members are actually carried out as designed, and emphasized the necessity of close joints to prevent the mixture escaping, the remedying of cracks, the removal of forms, clamps, and nails to hold the forms together, the repair and re-use of form work, the importance of clearing forms of all sawdust, dirt and chips before filling with concrete, and the wetting of timber to prevent sticking.

Of timber he said: White pine, yellow pine and spruce are all excellent, and should be free from knots; not so dry as to swell and bulge and thus distort the forms, nor so green as to shrink with the same result. Hard surfaced sorts may be used oftener without dilapidation.

The timber must resist the weight or pressure when a considerable height of wet concrete is being poured, as in walls and columns. Many authorities calculate this pressure as a liquid of half its own weight, viz.: 75 lb. per cubic foot. For concrete in layers no calculation is necessary, as practice had proved that for beams the bottom boards should be 2 in.-2½ in. thick, with sides 1½ in.-2 in. thick. Column sides should be 1½ in.-2 in. thick. For walls 1½-in. boards are used. A more solid board will insure greater economy, as the form can be repeatedly used. For slab panels 1-in. stuff is the usual thing, but 1-in. boarding requires staying every 2 ft.; 1½-in. boarding requires staying only every 4-5 ft.

Studs of adequate size should be spaced so as to prevent the boards between them from springing. They may be 2-in. x 4-in. to 2-in. x 6-in., if not used beyond 2-ft. x 3-ft. centers; 3x8 in. may be spaced about 4-ft. 6-in. centers; 4 in. x 10 in. at from 6-8-ft. centers; 6-in. x 12 in. from 8-ft.—10-ft. centers; but the spacing of supports must be governed by the nature of the weight coming upon the boards.

Of camber, Mr. Graham says: "It is necessary to give beams a camber of at least ⅛ in. in 5 ft.; i. e., $\frac{1}{480}$ of the span. This generally comes out during the ramming and tamping of the concrete and in the squeezing of the wedges. After the filling, the beams should be examined to see if the camber has come out, so that it may be again secured by tightening up the wedges before the concrete has set. In cases where a great deflection was found in the beams, the failure of the supports to the studs has been the root cause, due probably to soft ground. So judgment should be used to see that the sole plates under the supports are large enough to distribute the load safely over a sufficient area."

All timber supporting floors should be calculated for deflection rather than strength. Sanford E. Thompson's calculation for strength is quoted:

(1) Weight of concrete with reinforcement, 154 lb. per cu. ft.

(2) Live load: slabs, 75 lb. per sq. ft.; beams, 50 lb. per sq. ft.

(3) In calculating beams, planks, joists, use as the coefficient in the deflection formula a mean between the value for a beam fixed, $\frac{5}{843}$, and a beam supported, $\frac{1}{384}$. This average amounts to $\frac{3}{384}$. Then the deflection $= \frac{3}{384} \frac{W}{E} \frac{l}{I}$, where

W = total weight or load (in lbs.),
l = length of span (in inches),
E = elastic modulus = 1,300,000,
I = moment of inertia.

The moment of inertia is, of course, $I = \frac{b\ d^3}{12}$, where d = depth and b = breadth (in inches).

He limits the deflection to ⅛ in.

For struts the allowable compression stress must be reduced in proportion to their slenderness. If we assume them to be in a condition intermediate between pin-connected and fixed because of their flat ends, the values for spruce or fir may be taken as in the following table, wherein

l = unsupported length of strut in inches,
g = gyration radius of strut in inches,

g being equal to $\frac{d}{\sqrt{12}}$ for square struts, and to $\frac{d}{4}$ for round struts, where d is the diameter (in inches).

| Ratio of $\frac{l}{g}$ | 60 | 75 | 90 | 105 | 120 | 135 | 150 |
|---|---|---|---|---|---|---|---|
| Value of allowable compressive stress ..... | 960 | 900 | 825 | 675 | 450 | 410 | 340 |

# Pre-Cast Concrete Industrial Houses

Workmen's houses constructed of "shop made" concrete have been erected recently for employes of the No. 5 plant of the Alpha Portland Cement Co., at Manheim, W. Va. The houses vary from the 5-room semi-bungalow type to the cottage type of 6 rooms and bath. They were erected by the Simpson-Craft system, which permits the construction of reinforced concrete practically without forms, the greater portion of the work being pre-cast of minimum sections, made with the idea of using common labor in erection.

The construction consists of wall and floor slabs, together with belt and sill courses, floor beams and roof rafters made of standard sections and sizes for

Precast beams and slabs.

individual pieces. They may be assembled in any combination desired, so that while each building is made up of standard units, the general design may be varied, making it possible to produce a large number of buildings, using the standard units, but varying the exterior treatment.

The pre-cast sections of the buildings are made on casting tables or in moulds. This may be done either at the building site or in the yard or shop, and shipped to the site. If they are shipped, the sections may be packed in fine broken stone, sand or gravel, and the latter may be used at the site as an aggregate forming the studs, which are field-cast and form the binding element for the buildings. All of the pre-cast members entering into the construction are so designed that the metal with which they are reinforced projects beyond the end or edge of the pieces. In assembling the pre-cast sections in the buildings, they are spaced at intervals on the walls, leaving a space between the two sides of sections, and are then clamped together temporarily by means of channel shaped wood or metal forms covering the two open sides of the intervening spaces and forming a pocket into which reinforced bars are placed. The inside face of these pockets has a series of holes spaced about 7 in. on centers, into which are placed large wire hairpins. The pockets formed by the forms are filled with concrete, forming the studs of the building and binding all parts together.

The reinforced concrete beams of the floor construction, which are pre-cast, rest on the top of the wooden forms of the studs, the ends of the concrete beams, with their reinforcements, projecting into the pockets. When the casting is complete, the end of the beam rests directly upon the stud, and is securely anchored.

Upon the removal of the field forms, heavy waterproof building paper is placed against the inside face of the studs, beginning at the ceiling line and working down toward the floor, lapping the paper 4 in. at each joint, and securing the edges to the window and door frames. After this paper has been applied, hy-rib self-centering or other ribbed lath, is placed with the ribs against the paper, forcing the ends of the hairpin through the opening in the lath. Through these openings is then placed a heavy wire or ten-penny nail, and the loops of the hairpin twisted down onto the wire, thus anchoring the lath permanently to the stud. The same method is used in securing the lath to the ceilings, though, if desired, the paper may be omitted.

Grounds for the securing of wooden base, picture moulds, etc., are secured to the lath, or "spot" grounds may be used for this purpose; the walls and ceilings are then ready for plastering. Studs for the interior partitions are all pre-cast. Reinforcement for these studs project from the upper ends, the stud being of full height between the top of the floor slabs on which it rests and the under side of the floor beams. Between the top of these studs and the top of the floor beams, a distance of 12 in., is cast a girder or plate, binding the ends of the floor beams together and distributing the load over the studs. This permits of the variations in spacing of the studs for door openings, etc.

Roofs may be formed in a manner similar to the floors, using slabs directly on top of the reinforced concrete rafters. Where cement tile is used for roofing, the tile may be laid directly upon the reinforced concrete roof slabs. For other types of roof cover-

Completed house. Upper wall slab and part of floor beam are shown in foreground.

ing, dovetailed lath are built into the top surface of the roofing slabs, forming nail spaces for the roofing material.

The foundation walls may be either a solid 8-in. concrete wall on top of a concrete footing, or formed in the same manner as the walls in the building above grade. In the latter case, however, the slabs forming

the walls would be 2 in. thick instead of 1½, which is the standard thickness of the wall slabs.

Many designs of surfaces for outside walls may be obtained by the use of selected aggregate. The standard method is to finish the slabs under wood float, touching up the edges of the studs after they have been cast in the field.

Dry joints are used in assembling all the parts, though in casting the studs, all parts of the building are thoroughly grouted, forming a construction analogous to the placing of panels in the doors.—[*Engineering & Contracting.*]

## Establishing Definite Hauling Costs

When basing hauling estimates on the proven performance of the tractor-truck, contractors are dealing with definite costs and known quantities. Much of the element of risk attached to estimating with horse-drawn equipment is eliminated, the factor of luck in bidding becomes less of a consideration, and it is not only possible, but safe, to tackle larger contracts than could be profitably undertaken with the horse-hauled outfit.

The history of transportation repeats itself in the contracting business of today. In 1869 the locomotive supplanted the horse on the long overland haul across the continent and an outgrown service was discontinued. Today there exists a definite need for improved equipment for the short haul. Contractors' hauling needs are fast outgrowing the speed, endurance, and economy of the horse to cope with them. As in 1869, skilled engineers have had to solve the problem, this time with a new kind of "Iron Horse," the perfected gasoline tractor-truck—a mighty, mechanical "beast of burden," easily manageable and dependable, whose capacity and upkeep are measurable quantities and whose tireless strength, speed, and power meet every modern hauling requirement.

The tractor-truck concentrates and standardizes contracting effort and operating costs; lessens bidding risks, and assures profit, with safety, on close-figured contracts.

When you consider that in one of these powerful enduring units is embodied the working force of many horses the full meaning of concentrated effort becomes unmistakable. Such a centralizing influence builds the contracting business solidly, just as it has built lasting governments and effective armies.

Aside from almost unlimited variety of uses, the value of the tractor-truck as an economy is proven by the hundreds of concerns now using them at a vast saving of time, labor, repairs, depreciation. It is on the books of these firms that final proof is given of the economy of the tractor-truck as compared to that of the horse.

The tractor-truck is a fuel-consumer only when working; and where time is the essence of a contract, the job can be measured accurately by tractor-truck performance and the time limit met with confidence.

The mobility of the tractor-truck is clearly indicated by the accompanying photograph. Here is shown a massive elevator hoist in transit on a tractor-truck owned and operated by the Thomas Elevator Company, Chicago. Just such everyday achievements as this,, thousands of them, covering every kind of hauling, are fast dispelling any doubts as to the superiority of the tractor-truck over the horse-drawn equipment.

The ease with which the tractor-truck is manipulated facilitates loading, as it can be placed at right angles to its trailer when the latter is under a chute or on the edge of an excavation.

**A tractor truck with load (carrying Thomas hoist).**

A motor-tractor hauling a trailer train enables the transportation of separate materials without mixing and confusing them. With two sets of trailers, one may be transferred while the other is loading, keeping both tractor and men busy every minute.

## Sand and Gravel Pump of Improved Design

The American Manganese Steel Company of Chicago has developed a centrifugal type of pump for use in sand and gravel work which fills a long-felt need. Construction work of today requires increasing qualities of clean, sharp sand and gravel, and with this comes demand for the equipment which will produce these commodities most economically. The centrifugal pump has become the standard machine for gathering sand and gravel from lake and river beds—the chief sources of supply.

Sand and gravel are so abrasive in character that parts for pumps made of cast iron and cast carbon steel are readily worn out. Economy demands a metal in the pump which will resist this abrasive wear. Years

of experience in comparative tests with pump shells, runners, side plates and hubs manufactured of various metals has proved that manganese steel castings are the best suited for the severe conditions that are met with in sand and gravel pumping. When this fact was established the next step was to design a pump that would produce these products at the lowest cost.

The engineering department of this company co-operated with users of sand and gravel centrifugal pumps, and by close study of conditions and difficulties encountered in actual work developed the practical AMSCO sand and gravel pump. This pump was designed to give the greatest mechanical efficiency possible. The simplicity of the model combined with its sturdiness has reduced the maintenance cost to a minimum.

It is equipped with two side plates, one for the suction side and one for the hub side, permitting the pump to be used for either right or left discharge. The shell is not drilled and tapped for stud-bolts, but instead, a flange with slots is provided for the bolts which fasten the side plates to the shell. This feature eliminates the trouble which is experienced due to the breaking of the stud-bolts, and when sand has cut the bolts out it permits the removal and replacement of the side plate much more easily and quickly. Moreover, an air-tight joint is obtained by virtue of the fact that the gaskets are solid rings, without the perforations required when stud-bolts are used in the shell.

The hub side plate is so designed that practically no sand can enter the hub bearing, thereby preventing excessive wear on both the shaft and the bearing, usually a source of constant trouble, as every pump operator knows. The hub is so designed that the bearing is placed close to the runner; the distance from the center of the hub-bearing to the center of the runner is, therefore, very materially reduced. This means better balancing when the runner operates at high speed, less vibration of the pump when under a heavy load, and far less likelihood of breaking the shaft.

The runner is equipped with renewable shoes, is free from hubs on both sides and is designed to fill the shell completely. Greater efficiency results and the pump operates more smoothly.

The shaft and runner can be removed without disturbing the suction side plate and suction pipe. This is due to the fact that the hub side plate is removable, a practical advantage which every pump user will be quick to appreciate. Considerable time is lost when removing and replacing suction side plates in pumps lacking this essential feature, to say nothing of the difficulty experienced in getting the plate back in position so that it is air-tight. There is also the added difficulty under the old designs that a number of sections of suction pipe had to be replaced when such adjustment became necessary. Very often the pumps are erected close to the edge of the barges, with the suction side towards the water. This position, which is common practice, makes it very difficult to remove and replace the suction side plate and pipe. AMSCO pumps, however, avoid these common failings, and save valuable time through correct design and efficient operation.

Full details of the AMSCO Sand and Gravel Pumps may be obtained by writing for bulletin No. 72 to the American Manganese Steel Co., McCormick building, Chicago, Ill.

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The National Association of Sand and Gravel Producers, with headquarters at 609 Majestic building, Indianapolis, Ind., has opened an office and information bureau in Washington, D. C., from which bulletins of information relating to the sand and gravel industry will be issued from time to time.

## News Items

Canada has made such a marvelous record in shell production in the last five months that the United States government has begun placing big contracts with the big Dominion plants. The latest order is for $12,000,000 worth of 8 and 10-inch shells placed with the Canada Cement Corporation, which has begun construction of a $3,000,000 plant to take care of the order.

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The Alsen American Portland Cement Co.'s plant at Alsen, near Saugerties, N. Y., owned by German capital and which was taken over in spring by Alien Property Custodian A. Mitchell Palmer, is being appraised by R. M. Cleverdon, a government appraiser. The works is the largest of the three plants in the cement zone and up to early spring had been in operation for more than 15 years.

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As a result of the prolonged drouth and water shortage many ranchmen and farmers of Western Texas are constructing concrete water storage tanks. Some are very large size capable of holding sufficient water to supply thousands of cattle. Underground concrete-lined silos are also being built.

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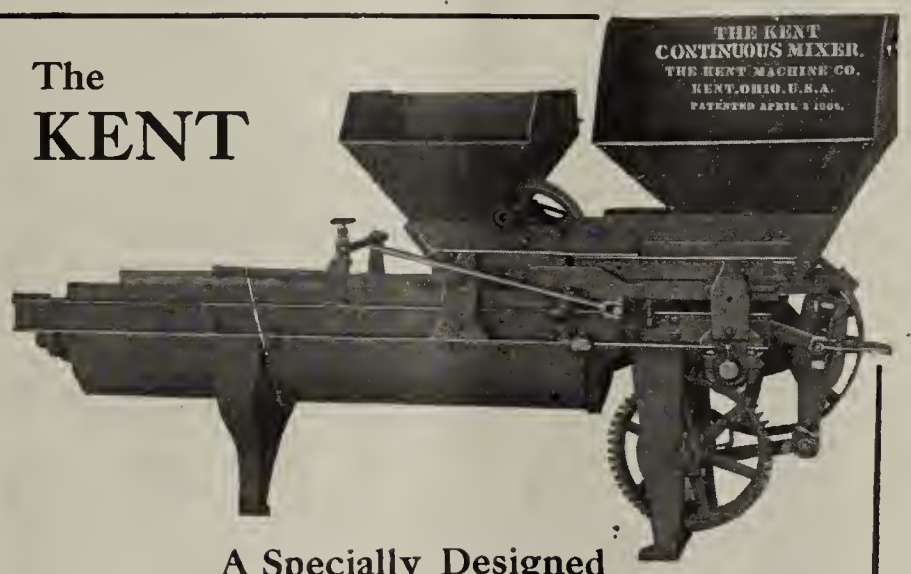
## Sand and Gravel Gates

A new catalog concerning gates for governing the discharge of sand, gravel and crushed stone has just been issued by the Beaumont Mfg. Co., 460 Chestnut St., Philadelphia, Pa. A request brings it to you by return mail. It contains interesting ideas and invaluable information (illustrated) you need concerning gates that can be used advantageously in your plant.


The
KENT

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Seventy per cent of the bigger block, tile, brick and specialty concrete products plants of the country use the famous Kent Mixer.

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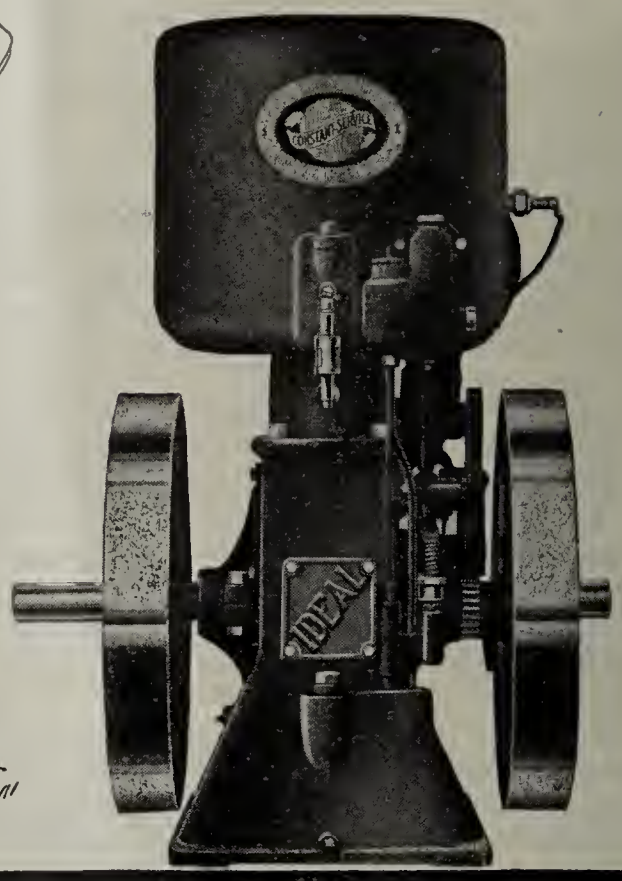


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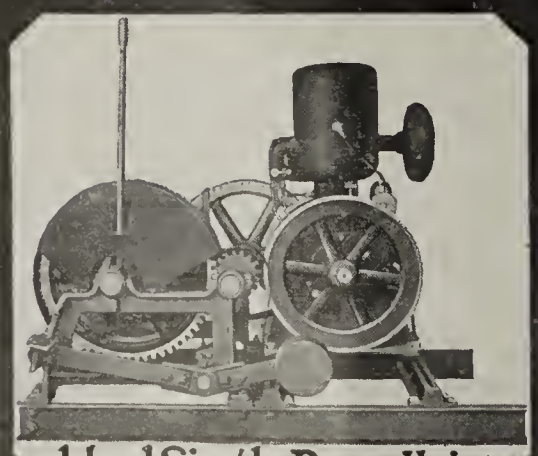

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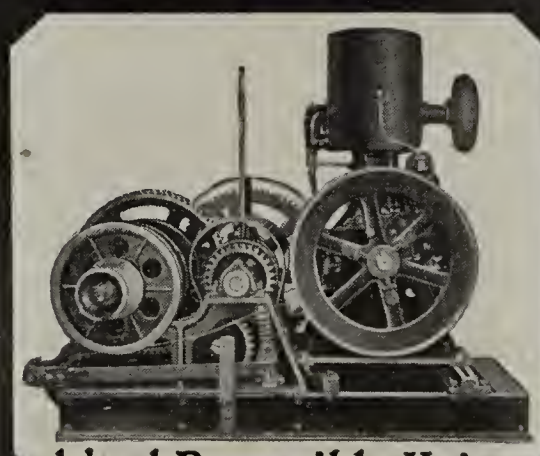
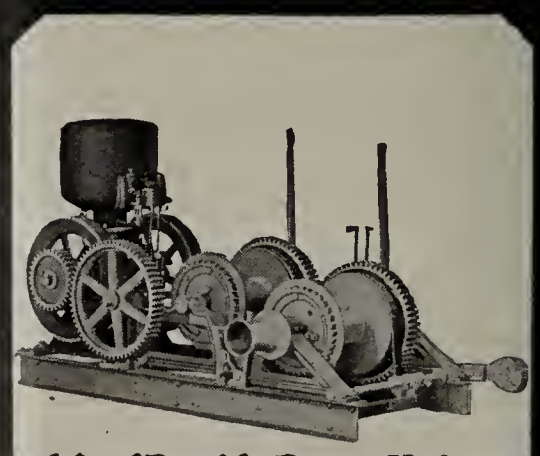


Ideal Reversible Hoist



Ideal Double Drum Hoist

**Northwestern Steel Forms**

Recognized as standard, used and recommended by leading contractors and engineers everywhere. Saves man-power, money and time in construction of tile, culverts, flumes, sewers, drains, and all such work. Standard or special sizes; round or elliptical. For particulars write for Bulletin 29.

NORTHWESTERN STEEL & IRON WORKS

*Capital $200,000* EAU CLAIRE, WIS.

***Moderate in Price and with a Reputation for doing more than is claimed for them***

Jaeger Mixers **make** good because they are **made** good. No useless parts—no skimping. They are big enough for the big jobs and not **too** big to handle the little ones with profit.

And there's a Jaeger Mixer that just fits **your** needs. Let us tell you about it.

**The Jaeger Machine Company**

**212 Rich St. Columbus, Ohio**

# Is *Your* Plant Producing CEMENT TILE?

**DUNN EQUIPMENT**
TILE MACHINES
BLOCK MACHINES
CONCRETE MIXERS
SEWER PIPE MOLDS
CONCRETE PORCH AND CHIMNEY MOLDS
—and a complete line of concrete machinery

THERE is tile business waiting for you—at good profits, and without manufacturing difficulties.

Your plant can easily be made ready for tile making because you already have part of the equipment.

After harvest comes drainage; now is the time to get ready for big tile sales.

Dunn equipment is standard for making high grade tile easily, quickly and at good profits.

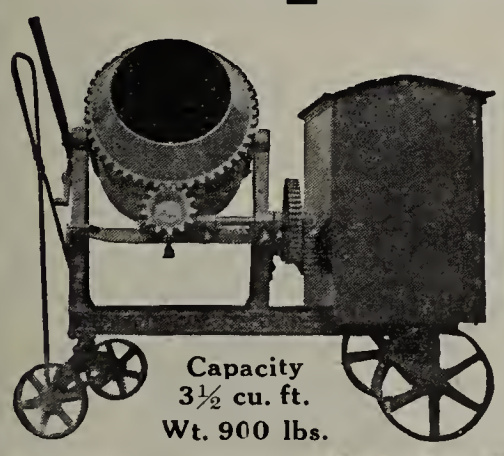
**GET THIS BOOK**

All the facts and figures on the tile business and Dunn equipment are in this book; write for a free copy.

**W. E. DUNN MFG. CO.**

414 24th Street HOLLAND, MICH.

# Republic Mixers will save you money




Before you buy a mixer, look over the Republic line. The prices are reasonable, the machines are ready to ship and the terms may be arranged to accommodate you. Line includes tilting and non-tilting types from 3½ to 10 cubic feet capacity, low charging, power loaders, etc.

## Power Mixer $160.00

This mixer is complete with all-steel construction, including truck, engine and housing. A bargain!

## Hand or Belt Mixer $55.00

Write for the big Republic Mixer catalog.

**REPUBLIC IRON WORKS,** Box 454 TECUMSEH, MICH.

# BELTING

"V-B" Balata
"AMPERE" (Canvas Stitched)
"WHITE SEAL"

Write for Prices, Discounts and Samples

**VICTOR BALATA & TEXTILE BELTING CO.**

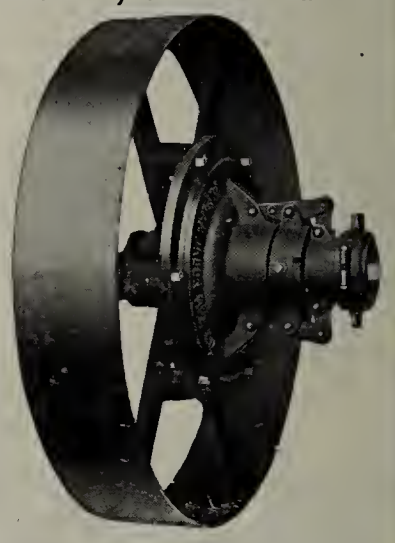
Factory: Easton, Pa. Main Office: 38 Murray St., New York
Stores: 167 N. Market St., Chicago, and 87 High St., Boston

**CONVEYOR BELTS A SPECIALTY**

# LITTLE DAILY LEAKS OF POWER BOOSTS YOUR COAL BILL

The High Cost of Power Is Reduced to a Minimum By the Use of a

## Plamondon Disc Type Friction Clutch



The power of this clutch is unusual. The double toggles on this clutch develop such tremendous pressure that even on the largest clutches only a hand lever is needed to engage or disengage the clutch. The geared devices usually needed to operate large clutches are unnecessary.

This is only one of the practical advantages the cement mills find in this clutch. Write for our new catalog No. 59 and learn the rest of them.

WE ALSO MANUFACTURE GEARS

**A. Plamondon Mfg. Co.**

12-24 N. Clinton St. CHICAGO, ILL.

Cut Gears

Spur,
Spiral,
Bevel and Worm
Steel and Rawhide

*Accuracy and Prompt Delivery*

When you want a gear cut you want it **quickly,**—we emphasize our promptness without sacrificing accuracy.

## Ganschow Cut Gears

stand first in accuracy—perfect mesh—silent operation and the quality that counts for long service.

*Estimates furnished from drawings and specifications.*
*WRITE FOR CATALOG.*

**WILLIAM GANSCHOW CO.**
1003 W. Washington St. - CHICAGO

## Everything in CUT GEARS

We have the largest and most modern equipped gear making plant in the west. Our gear making machinery embraces everything known that will in any way facilitate the manufacture of high-grade cut gears of all kinds up to 15 feet in diameter.

**Quick Deliveries, Low Prices and First Class Work Our Motto**

## Foote Bros. Gear & M. Co.

**210 to 220 N. Carpenter St., Chicago**

# Pebbles for your tube mills

**Superior to Flint Pebbles and Will Not Break**

Tested by Engineers and Chemists
Shipments Promptly Made
Satisfaction Guaranteed

**Peruvian Tube Mill Pebble Co.**
152 Colmena Ave. LIMA, PERU

# BALLS

Forged steel balls of special analysis steel from 2" to 15" in diam. carried in stock. Can't be excelled.

BALL MILL PLATES
CRUSHER SHAFTS
GRIFFIN MILL SHAFTS
GRIFFIN MILL CONVEX SEATS
GRIFFIN MILL CROSSHEADS
PIPE FLANGES for High Pressure Work
STEAM SHOVEL, TRUCK AND CAR AXLES

**Hammer and Hydraulic Press Forgings of all kinds**

*We make quick service a feature of our business*

**TIOGA STEEL & IRON CO.**
52nd AND GRAY'S AVENUE, PHILADELPHIA, PA.

# IMMEDIATE DELIVERY

"Franklin"

ROUND—SQUARE—FLAT—SQUARE TWISTED

## STEEL BARS
for CONCRETE REINFORCING

We can meet your Reinforcing Steel Requirements. This means not only quick shipment from the mills but co-operative service for rapid transportation. If you want to know just what your exact cost will be, send us the Blue Prints and we will give you a lump sum bid on all the steel sheared to lengths, bent to specifications and delivered to the job,

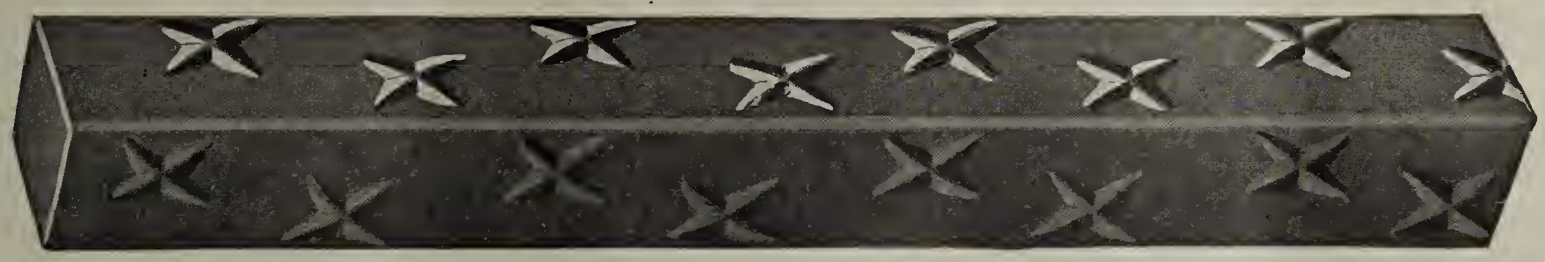
*Our Engineering Department is at your service.*

**The FRANKLIN STEEL WORKS**
FRANKLIN, PENNA.

Cleveland, 1320 Rockefeller Bldg.
Boston, - - 12 Pearl Street
Philadelphia. 2215 Race Street
New York, - 30 Church Street
Chicago, - - 332 So. Michigan Blvd.
Buffallo, - Erie County Bank Bldg.
Pittsburgh, Oliver Bldg.

QUALITY SERVICE

# Inland Deformed Bars



In Open Hearth Steel (New Billet Stock), Hard Grade, and Rail Carbon Steel (Rerolled).

The mechanical bond is theoretically correct and is guaranteed by us, having been designed by expert concrete engineers and approved generally by engineers and architects.

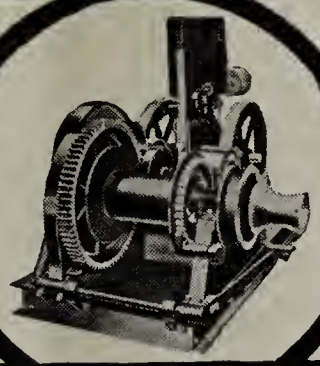
The corners are rounded to prevent splitting of the concrete. Bending, fabricating and setting are easily done with these bars. Sizes ⅜ to 1¼ inch. Lengths up to 85 feet.

Prompt shipments during 1918.

**INLAND STEEL COMPANY First National Bank Bldg., CHICAGO**

# Boss "HEAVY DUTY" Contractors' Hoists

Gasoline — Kerosene or Electric Power—reliable as steam. Absolutely dependable. $5 to $10 a day cheaper to operate. Three sizes—6, 8, 10 H.P. Three speeds —100, 150, 200 ft. Rope Travel. Hyatt Roller Bearings. Prompt Deliveries. Write, wire or 'phone nearest branch office.



Over 100 Ordered for USE "SOMEWHERE IN FRANCE"

**THE AMERICAN CEMENT MACHINE CO., Inc., Keokuk, Iowa**

BRANCH OFFICES—New York, N. Y.; Cambridge, Mass.; Richmond Va.; Pittsburg, Pa.; Cleveland, O.; Indianapolis, Ind.; Louisville, Ky.; Chattanooga, Tenn.; St. Louis, Mo.; New Orleans, La.; Chicago, Ill.; Minneapolis, Minn.; Denver, Colo.; El Paso, Tex.; San Francisco, Calif.; Seattle, Wash.; Spokane, Wash

# Luten, Roberts & Titus

INDIANAPOLIS

*Designing and Consulting Engineer*

*Reinforced Concrete Bridges Exclusively*

Associate Engineers in each State

BECAUSE WE SPECIALIZE ON

**Lock Seam Pipe** with the smooth inside surface, having already furnished large quantities for Potash Recovery plants, we are able to give especially careful attention to the construction of this class of Pipe.

**Robertson Bros. Mfg. Co., Chicago**

# LAST WINTER
## Had Its Problems

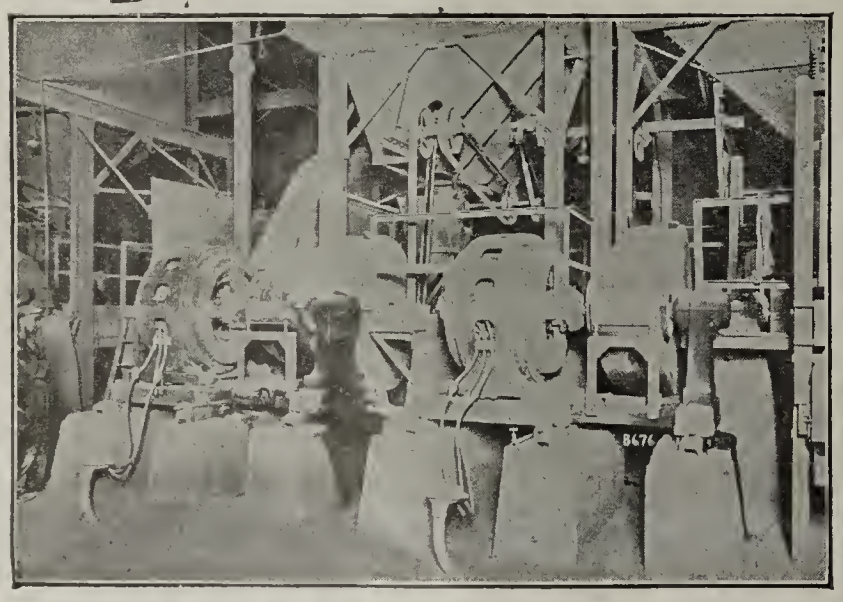
The *lack of coal* in our nation's factories, caused either complete shutdowns or serious delays on urgent orders. It was *then,* that plant-owners realized that central station power would have assured much better operating conditions:

*First:* The wide use of central station power *reduces the number of points* to which coal must be distributed. Thus, power is not only guaranteed to the average user, but the expense of an individual power plant is eliminated and here results a saving of freight cars and fuel that will help win the war.

*Second:* Central stations, specializing in power production, and *possessing larger and more efficient generating equipment,* can *supply* power cheaper than the average user can *produce* it. To the progressive manufacturer who conducts his business on the principle that quantity production decreases costs, what truth could be more evident? Employment of the electric drive means

## Less Worry About Coal Piles

*Westinghouse Induction Motors driving tube mills at the plant of the Pennsylvania Cement Co., Bath, Pa.*



The advantages to be gained through electrification, can be best guarded and maintained with the use of rugged, lasting and always dependable

## Westinghouse Apparatus

Westinghouse cement mill experts will be glad to consult with you.

**Westinghouse Electric & Mfg. Co.**
**East Pittsburgh, Pa,**

W WESTINGHOUSE ELECTRIC

# Westinghouse

**THE FULLER ENGINEERING COMPANY**

**Designing, Constructing and Operating Engineers**

**Cement and Hydrated Lime Plants a Specialty**

**Reports, Examinations and Analyses of Raw Materials for Cement Consultations Solicited**

**Offices: Allentown National Bank Bldg.**
**ALLENTOWN, PA.**

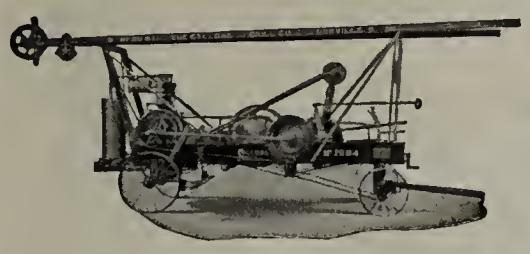
**WATER**

**WE-FU-GO AND SCAIFE**

**PURIFICATION SYSTEMS SOFTENING & FILTRATION FOR BOILER FEED AND ALL INDUSTRIAL USES**

**WM. B. SCAIFE & SONS CO. PITTSBURGH, PA.**

**A Big Blast-Hole Drill That's Reliable**



**The Cyclone No. 14**

Heavy, solidly braced frame — Sill timbers 4" x 14". All machinery placed directly on the main sills protecting it against strains and preventing top heaviness. **Eighty per cent (80%) of the castings are cast steel**—not cast iron. The Cyclone No. 14 is the only Blast-Hole drill so built. Furnished in Steam, Gasoline, Compressed Air or Electric Power; traction or non-traction.

**The Sanderson Cyclone Drill Co., Orrville, Ohio**
**Eastern and Export Office, 50 Church St., New York, N. Y.**

**PULVERIZED COAL EQUIPMENT**

AERO PULVERIZER CO., 120 BROADWAY, N.Y.

## WOULD YOU USE AN INTERMEDIATE SYSTEM FOR CONVEYING YOUR FINISHED GRAVEL FROM PLANT TO CAR IF YOU COULD SPOT THE CAR UNDER THE SPOUTS OF THE BIN?

Not If You Could Help It Would You?

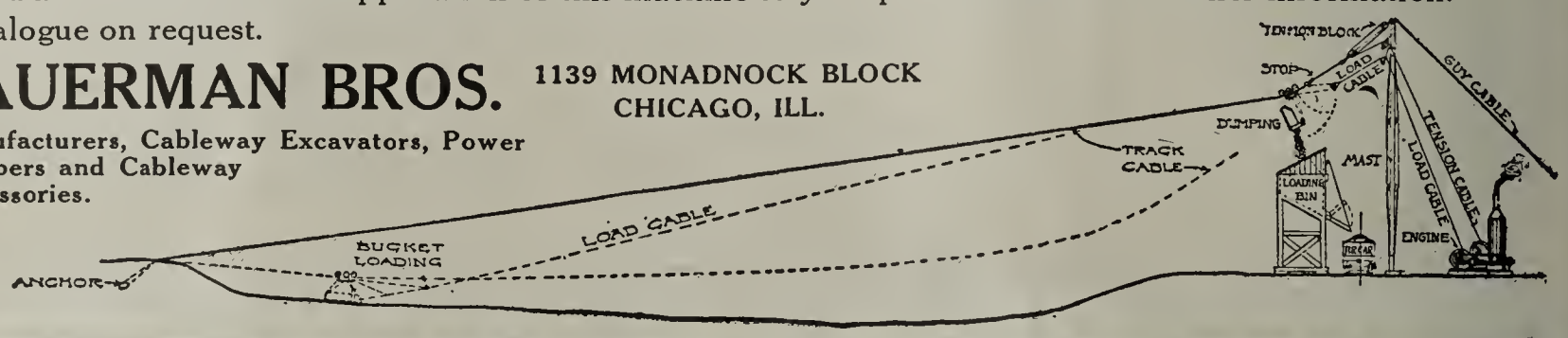
Then is it not just as logical to do away with an intermediate conveying system between **pit** and plant?

Are you using one machine for digging the material and another to convey it to the plant when you could just as well use one machine for the combined operation, saving the additional labor, machinery and upkeep cost?

The Sauerman Dragline Cableway Excavator is digger, conveyor and elevator combined in one.
It is the direct method from pit to plant.
It digs, conveys, elevates and dumps in one continuous forward operation.
Operated by a double drum friction hoist under one man control.
One Machine—One Operation—One Man Control
If you are interested in the application of this machine to your plant write us for further information.
Catalogue on request.

**SAUERMAN BROS.** 1139 MONADNOCK BLOCK CHICAGO, ILL.

**Manufacturers, Cableway Excavators, Power Scrapers and Cableway Accessories.**



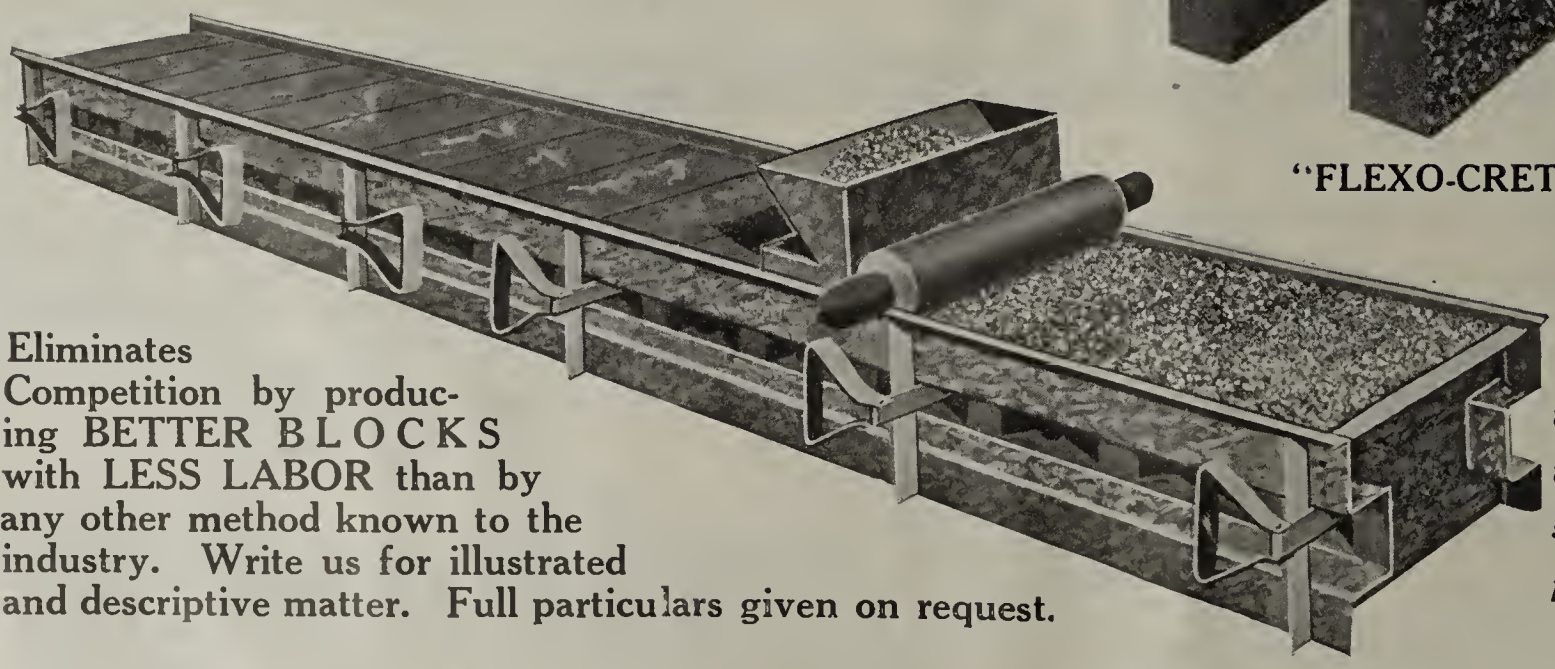

# Flexo-Galvanized Steel Moulds

For Producing

# Poured Concrete Building Stone

Greatest Labor Saving Device of the Times.
A God send to the Building Block Industry.

"FLEXO-CRETE"



Eliminates Competition by producing BETTER BLOCKS with LESS LABOR than by any other method known to the industry. Write us for illustrated and descriptive matter. Full particulars given on request.

*We ship on thirty days trial to responsible parties.*

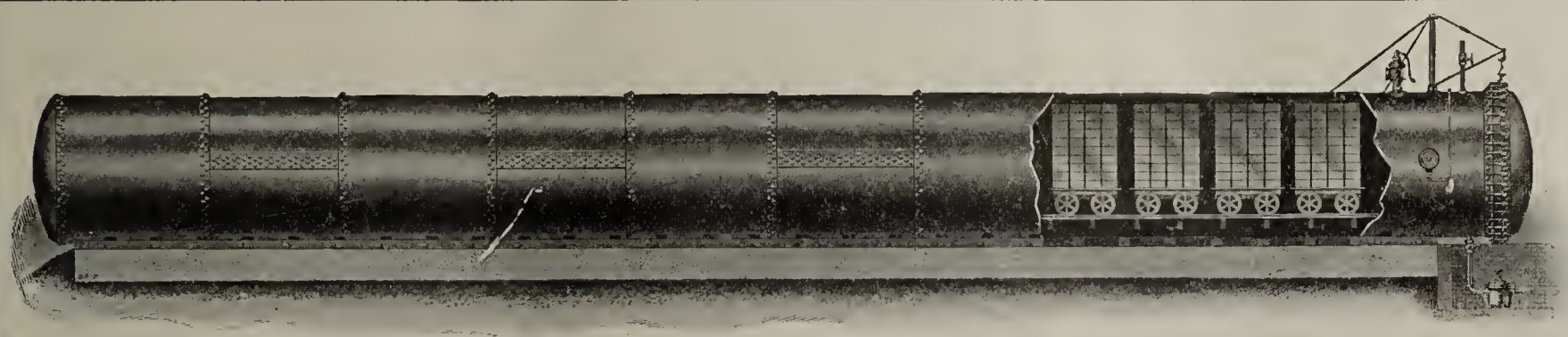
**Flexo-Concrete Mould Company.** **Cedar Rapids, Iowa**

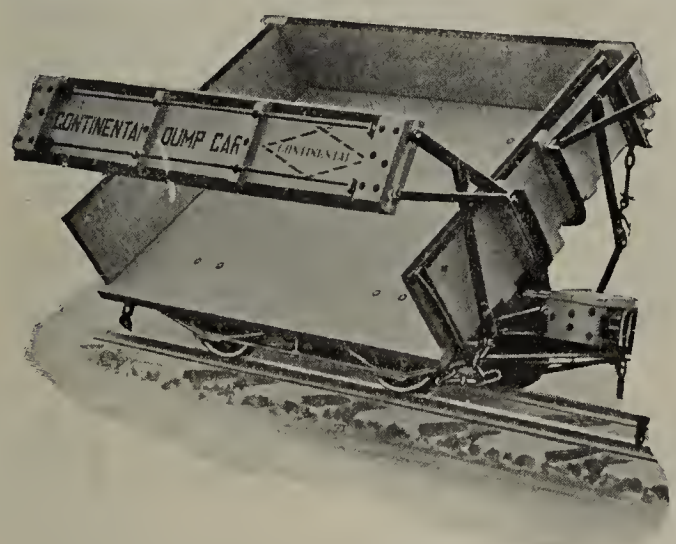
# Sand Lime Brick Machinery

Our complete line of Sand Lime Brick Machinery makes it possible to secure just that machinery which is required to make your plant a success. We favor no particular type of machinery but are guided by the needs of the customer. Our wet and dry grinding mills have transformed a number of unsuccessful plants into dividend producers, while our Presses, Mixers, Hardening Cylinders and other equipment are of equal quality. We can exactly meet the demands of any manufacturer with a quality of machinery which will operate at a profit with a minimum amount of attention and expense.

*Correspondence solicited*

## The American Clay Machinery Co.
WILLOUGHBY, OHIO





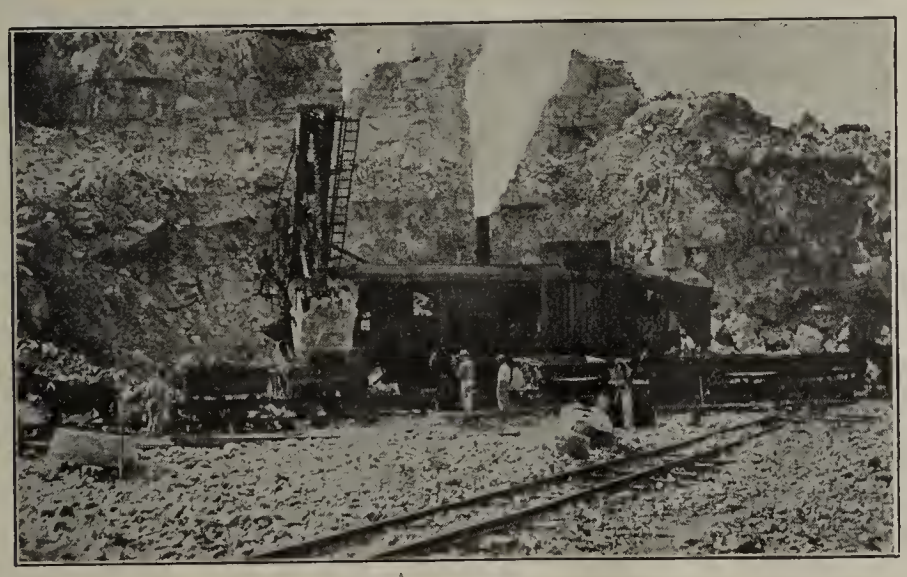

# CONTINENTAL DUMP CARS

## Built Better Than Ever

For staunch construction, quality of materials used, general all round serviceability and satisfaction, they challenge all competition.

**We build all sizes and types of industrial cars for any specific requirements. Write us concerning your needs.**

## Continental Car Co. of America, Inc.
General Sales Office and Works, Louisville, Ky.



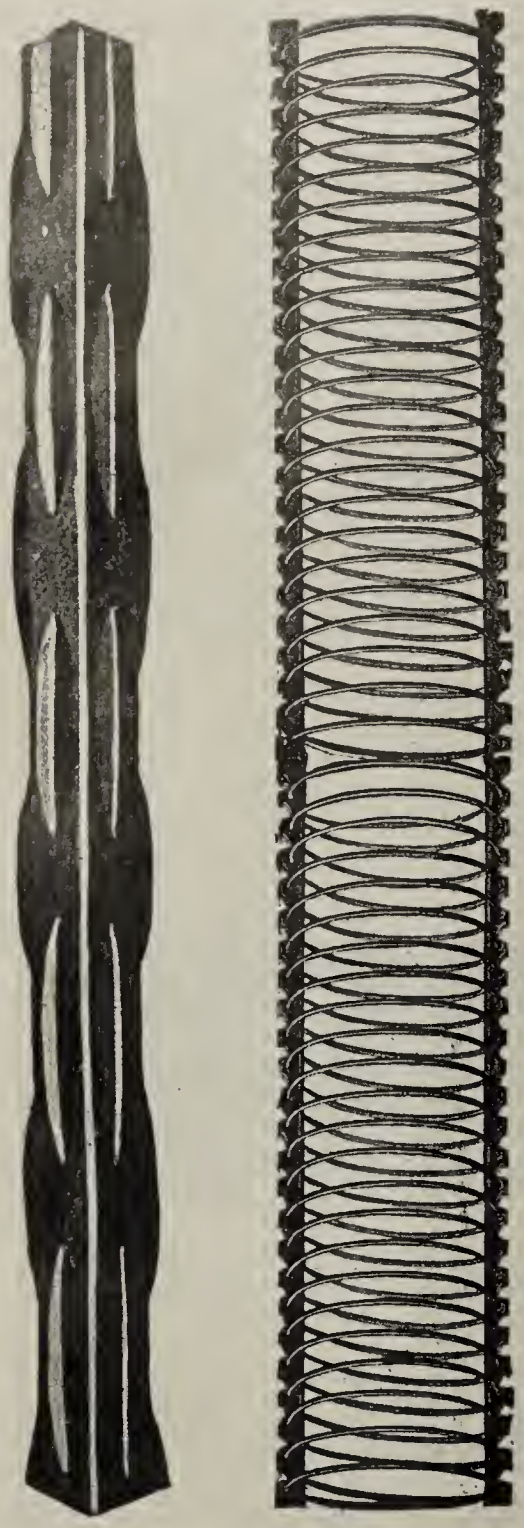
# Western Dump Cars for Stone Quarries

## We Build Them Strong. They Are Made of the Very Best Material

This interesting picture taken in an Arkansas stone quarry. One mule draws a 2-car train to the crusher. One of many industrial uses for Western Dump Cars. They are used for hauling all kinds of material in all parts of the world.

*Write for Catalogue and Prices*

## Western Wheeled Scraper Co.
AURORA, ILL.



# STEEL BARS

AND

# SPIRALS

FOR

REINFORCED CONCRETE CONSTRUCTION

# "Bars on the Job Ready for Your Men"

Delay, caused by the failure to have your reinforcing material on the job not only throws out your calculations but also the schedule of every other contractor on the job.

You can save the loss of much time and money by specifying Havemeyer Bars for your reinforced concrete work.

Their prompt service insures your having bars on the ground when the men go to work.

# HAVEMEYER BAR

Service insures direct shipments of reinforcing steel from our Chicago warehouse, which is located within easy teaming distance of the loop and makes delivery when material is needed.

Havemeyer Products, Bar-Tys, Bar-Spacers, Ty-Chairs, Beam-Saddles, Etc., keep the steel in its right place while the concrete is being poured.

*Try Our Service*

## CONCRETE STEEL CO.

MONADNOCK BLDG. CHICAGO

# INVESTIGATION AND EXPERIENCE ARE PROVING THE RELIABILITY OF HYDRATED LIME

## FOR WATER PROOFING AND TO FACILITATE POURING CONCRETE

In these 51 concrete storage tanks, recently erected in Cedar Rapids, Iowa, by the Quaker Oats Co., there are approximately 12,500 cubic yards of concrete—1-2-4 mix. The walls are perfect cylinders, with no lips or bulged surfaces.

Hydrated lime was used for waterproofing and also to facilitate pouring the concrete and lifting the forms, owing to its lubricating properties. In mixing, 25 pounds of hydrated lime was put into each batch, which made the percentage of lime to cement a little over 8% by weight. The mixers used were of such size that three bags of cement could be used in each batch.

Considerable credit is given by the Leonard Construction Co. of Chicago to the lime. The statement is made that the lime gave the exterior surface a white and uniform appearance, and that the surface needed no subsequent coating. There were no joints where the concrete stuck to the forms and "lifted," as it does in many cases where the concrete is not of uniform mixture.

***Write any of the following competing manufacturers of Hydrated Lime for complete informatoin about Hydrated Lime in Concrete***

**Marblehead Lime Co.,** Chicago—Kansas City

**Glencoe Lime & Cement Co.,** St. Louis, Mo.

**The A. & C. Lime Co.,** Canton, Ohio

**John D. Owens & Son Co.,** Owens, Ohio.

**Port Byron Lime Assn.,** Port Byron, Ill.

**Ste Genevieve LimeCo.,** St. Louis, Mo.

**Kelley Island Lime & Transport Co.,** Cleveland, Ohio

**Woodville Lime Products Co.,** Toledo, Ohio

**O. C. Barber Allied Industries Co.,** Canton, Ohio

**Palmer Lime & Cement Co.,** 103 Park Ave., New York, N. Y.

**National Lime & Stone Co.,** Carey, Ohio

**Merion Lime & Stone Co.,** Norristown, Pa.

**Lee Lime Co.,** Lee, Mass.

**Rockland & Rockport Lime Co.,** New York—Rockland, Maine—Boston

**Ohio Hydrate & Supply Co.,** Woodville, Ohio

**Vermarco Lime Co.,** West Rutland, Vt.

**Riverton Lime Co.,** Riverton, Va.

**Union Lime Co.,** Milwaukee, Wis.

# For Sale

500 tons new O. H. 105 lb. NYC standard rails with splices.

1000 tons new O. H. 90 lb. ASCE rails with splices. Will quote on entire quantity or on such lots as required for prompt shipment.

**M. MITSHKUN CO.,**
BOOK BUILDING
DETROIT, MICHIGAN

LOCOMOTIVE CRANES
STEAM SHOVELS
LOCOMOTIVES
CARS
RAILS
HOISTING ENGINES
GRAB BUCKETS
STONE CRUSHERS
COMPRESSORS
ETC.

Try us for honest value in dependable "used" material of this character. We'll treat you right.

**Wm. B. Grimshaw Co.**
1052 Drexel Bldg., Phila., Pa.
Dealers in "Used" but "Not Abused" Machinery

FOR SALE
# Rebuilt Machinery
## For Immediate Delivery

1—16x32x42 Cross-Compound Murray Rolling Mill Corliss Engine, belt drive.
1—400' Worthington Surface Condenser.
2—66"x16' Tubular Boilers.
1—16x36 Double Eccentric Heavy-Duty Fulton Corliss Engine, belt drive.
1—14x20 Atlas Automatic Engine, belt drive.
1—40x60 No. 10 gauge Steel Stack.
1—36x70 No. 10 gauge Steel Stack.
1—5x7½ Vertical Throttling Engine.
1—Induced draft Fan, 60" diameter, 30" outlet—steam driven.
1—20x34x28 Tandem Compound Fitchburg Engine, direct connected to 300 KW. direct-current G. E. generator.
1—450 KW. G. E. Alternator, 2300 volts, 3 phase, 60 cycle, direct connected to E. P. Allis Cross Compound Engine; steam driven surface condenser with switchboard panel and instruments.
1—800 KW. G. E. Alternator, 2300 volts, 3 phase, 60 cycle, direct connected to McIntosh & Seymour horizontal heavy-duty engine, 100 RPM.
1—New 350 HP. IXL Open Feed Water Heater, purifier and receiver, with cut-out valve and oil separator.

**H. J. GEBHARDT**
**1421 FISHER BUILDING** **CHICAGO**

*New and Second Hand Bargains*
# CARLIN'S
SHEARS DERRICKS
GRINDING PANS
ELECTRIC HOISTS
BUCKETS
*Same location for 69 years*
**JOHN H. CARLIN MACHINE CO.**
140 Lacock St., N. S., Pittsburgh, Pa.

# For Sale by Owner

1—American Hoist Engine, 5½"x8", D. C. D. D., with Sleuthing Attachment & Boiler.
1—No. 5 AUSTIN Gyratory Crusher.
600' 1¼" Plow Steel Cable.
1—INGERSOLL-RAND Air Compressor, Imperial type 10, Double Stage, 12x12 & 7½x12, capacity 327 Cubic Feet, direct connected to General Elec. 50 H. P. Motor with Auto Starter and including Receiver Tank and Automatic Unloader.
1—All Steel Derrick with Bull Wheel, and Interchangeable Boom for lengths 30', 60', 90' and 110'.
1—General Elec. 50 H. P. Motor, A. C., 2 phase, 860 R. P. M.

**BETTENDORF STONE COMPANY**
**820 Kirkwood Blvd.** **Davenport, Iowa**

# Scrap Cement Bags

We are in the market for an unlimited quantity of scrap cement bags. Write or wire prices, stating quantity and whether dusted or not.

**Clayton Shoddy & Cotton Mills**
**CLAYTON, N. J.**

FOR SALE
## SMALL RODS

18 tons ¼-in. plain squares, 8—21 lengths.
20 tons ¼-in. plain rounds, 8—21 lengths.
20 tons ¼-in. deformed squares, 8—30 lengths.
30 tons ¼-in. deformed square, 8—30 lengths.

Immediate stock shipment, cut to lengths if desired. Will sell any part or all, also a miscellaneous quantity of larger rods.

**MODERN ENGINEERING CO.**
19 So. La Salle St., Chicago, Ill.

17—12-yd. Western
## DUMP CARS
excellent condition, $1050 each.

3—Stg. gg.
## LOCOMOTIVES
1—50-ton, 6-wheel switcher, $6500.
1—30-ton 4-wheel switcher, $5500.
1—50-ton 6-wheel switcher, $10,000
*All excellent condition, ready for immediate service.*

**THE FRED R. JONES CO.**
**City Hall Square Bldg., Chicago.**

## Do Business by Mail

It's profitable, with accurate lists of prospects. Our catalogue contains vital information on Mail Advertising. Also prices and quantity on 6,000 national mailing lists, 99% guaranteed. Such as:

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| War Material Mfrs. | Wealthy Men | Fly Paper Mfrs. |
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Write for this valuable reference book. Also prices and samples of Fac-simile Letters.
*Have us write or revise your Sales Letters.*
Ross-Gould, 1001 Olive Street, St. Louis

**ROSS-GOULD**
**Mailing Lists** **St. Louis**

# Relaying Rails

We have for immediate shipment:
250 tons of 30-lb. Relaying Rails.
150 tons of 35-lb. Relaying Rails.
Complete, with splice bars.
Atlanta (Ga.) delivery.
***Write or Wire for Price***

**The Isaac Joseph Iron Co.**
**525 Reading Rd.** **Cincinnati, O.**

# EQUIPMENT BARGAINS

## FOR SALE—IMMEDIATE DELIVERY

The following equipment in first-class operating condition, used on our completed contract for the construction of the Fourth Lock at Sault Ste. Marie, Michigan, for the United States Government:

35—Western, 5-yd., heavy-duty, two-way, 36-in. gauge **dump cars.**
26—Lakewood, two-line, bottom dump, **concrete buckets,** 65 cu. ft. capacity.
2—Owen type "H" **clam shell buckets,** 2 cu. yd. capacity.
1—Chicago Pneumatic Tool Co. **air compressor,** 164 cu. ft., 100-lb. pressure, with receiving tank.
1—Steel **stiff-leg derrick,** 25-ton capacity, 80-ft. boom, with bull wheel.
4—**Steel guy derricks,** 10-ton capacity, 80-ft. mast, 70-ft. boom.
1—**Traveling derrick,** 25-ton capacity, 80-ft. steel boom, with bull wheel.
1—Thomas double-drum **electric hoist,** with 100-hp. D. C. motor.
1—Patone **steel chain elevator,** 35-ft. centers.
1—Dean **steam condenser,** 8x14x12.
12—Koppel **steel flat cars,** 19 ft. x 4 ft. x 8 in.; 36-in. gauge; 30,000-lb. capacity.
2—**Ransome mixers,** 2 cu. yd. capacity, with 50-hp. A. C. motor.
1—Erie 16x18 stationary **horizontal engine.**
1—Leonard-Ball 7x10 stationary **horizontal engine.**
4—Leyner-Ingersoll piston type **steam drills.**
2—Ingersoll-Rand "Bull Moose" BCR type **drill.**
1—Ingersoll-Rand "Jap" BCR type **drill.**
4—Ingersoll-Rand **rock drills,** complete with weights and tripods.
1—Yeoman's 4-in., class "M," double-suction horizontal **centrifugal pump,** capacity 500-G.P.M.
1—**Belt conveyor,** for handling crushed stone.

*For further particulars, address*

**OSCAR DANIELS CO., First National Bank Bldg., Chicago, Ill.**

## Sound Plant in Good Operating Condition For Sale

### AIR COMPRESSORS

1—2-cylinder 6x6 belt driven Gardner-Rix, capacity, 80 ft. per minute.
2—Ingersoll-Sergeant Class A, 18 x 8¼ x 24 Straight Line, steam-driven, 650 ft. per minute at 100 lb.
1—Rand Duplex, steam-driven, 600 ft. capacity with receiver.

### BOILERS

4—50-hp. locomotive type.
4—Vertical tubular. 1—12-hp. 1—15-hp. 1—20-hp.

### CABLEWAY

1—Lambert, 6-ton, 900-ft. span.

### CENTRIFUGAL PUMPS

1—18-in. Morris direct connected to double vertical steam engine.
1—10-in. Buffalo, double suction, belt driven.
1—15-in. Buffalo, belt driven.
1—20-in., belt-driven Worthington Turbine.

### DUMP CARS

20—3-yd. Peteler, 36-in. gage.
20 pairs of wheels and axles, for 4-yd. Western, extra heavy, brand new.

### ROCK DRILLS

100—McKiernan-Terry "Wizard" Rock Drills, 2¼ to 3-in., with tripods for air or steam, all brand new.

### FIRE PUMP

1—Worthington Duplex Fire Pump, 18½x9¼ x10, capacity 610 gallons per minute.

### CONCRETE MIXERS

2—Ransome, 1-yd. on skids, with steam engine, but no boiler.

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1—10x12 Lidgerwood compound geared to drum 41x52-in. Has 25-ton pull. Suitable for mine work.
2—American, 7x10, double cyl., 2 drum, with boom swinger, but without boiler.
2—7x10 American D. C. D. D., with swingers and boilers.

**Locomotives, Drills, Pumps, Steam Shovels, Etc.**

***All thoroughly overhauled and ready for immediate and constant service.***

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1—Set 42x16" "Superior" Crushing Rolls.
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1—Set 36x16" "Chalmers & Wlliams" Crushing Rolls.
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2—No. 5 "Chalmers & Williams" Gyratory Crushers.

Good price, good condition, subject to inspection and immediate shipment.

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BUCYRUS SHOVEL

Standard, Electric, 60-ton, with 2½ cubic yard dipper; capacity 250 cubic yards per hour, fully equipped with electric motors and automatic control throughout; operates with 2,200 volt or 440 volt; 3 phase, 60 cycle current; mounted on standard 8-wheel M.C.B. trucks. PRICE $25,000 f. o. b. cars in California. All in first-class working order, ready for immediate delivery.

Also, one

INSLEY DRAGLINE EXCAVATOR

with 2 one-half yard buckets operating, one going up, one down, over a fabricated steel framework of sufficient height for loading into cars or trucks, together with 56 h.p. distillate motor, double drum hoist, etc., original cost about $5,000.
PRICE $3,000 f. o. b. cars in California.

Also, one

WESTINGHOUSE 30 H.P. MOTOR

60 cycles; 3 phase; 2,200 volts; 850 R.P.M. with auto starter. In fine condition.

WILLIAM H. FORD
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### Rock Drills

6 3⅝" Murphy, nearly new
1 3½" Murphy, nearly new
1 3¼" Murphy, nearly new
2 3" Murphy, nearly new
23 Victor Jackhammer Drills, new

### Compressors

2,000 cu. ft. Rand and 50 others

### Boilers

2 300 H.P. Wickes Water Tubes
1 400 H.P. Wickes Water Tube
50 other boilers

*Largest Machinery House in America*

**Wickes Machinery Co.**
Jersey City, N. J.

## FOR SALE—Prompt Delivery

8½ Miles 24-in. gauge Koppel Track.
1 Climax Geared Locomotive, 24-in. gauge.
1 6-in. Morris Centriiugal Direct Connected Pump.

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One No. 4 March-Capron Concrete Mixer, without power, weight 7,000 lbs. Price 4c lb.

One Steel Cage, Hoppers, Wire Rope, etc., 5c lb.

One 5,000-lb. capacity two-drum Thomas Electric Hoist with 50 H.P. Motor; needs repair; $750.00.

One 28 H.P. Charter Gasoline Engine, $350.00.

TEUSCHER & SON MCHY. SUP. CO.,
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# FOR SALE—PROMPT DELIVERY

## *Owned By Us and Sold Under Absolute Guarantee*

### STEAM SHOVELS

1—95-C Bucyrus, shop No. 1304.
4—70-C Bucyrus, shop Nos. 1552, 1298, 1287, 1126, 2½-yd. dippers.
1—Standard 70-ton Bucyrus, shop No. 733, 2½-yd. dipper.
1—45-C Bucyrus, shop No. 1202; 1¾-yd. dipper.

### REVOLVING TRACTION SHOVELS

1—Model 28 Marion, ⅝-yd. dipper; shop No. 2988. Has moved 80,000 yd. Good as new; immediate shipment.
1—0 Thew traction shovel, shop No. 1002, ⅝-yd. dipper.

### DRAG LINES

2—No. 2 Monighan steam-operated all-steel draglines, 60-ft. booms, one 2-yd. and one 1½-yd. Page bucket, mounted on skids and rollers.
3—Class 24 Bucyrus Steam Drag Lines on skids and rollers; 100-ft. boom, 3½-yd. bucket. Shop Nos. 763, 764, 772. Built new in 1913 and 1914. As good as new; immediate shipment.

### DUMP CARS

25—16-yd. standard gage Western air dump cars, with steel lined floors.
22—12-yd. standard gage Western air dump cars.
2—12-yd. standard gage Oliver side dump cars.
9—6-yd. standard gage K. & J. side dump cars.
60—4-yd., 36-in. gage Western.
30—1½-yd., 24-in. gage.

### LOCOMOTIVES

1—18x24 cylinder, 10-wheel locomotive, weighing 55 tons, with 42 tons on drivers; built by American Locomotive Co. in 1907; steam pressure 170 lb., rigid wheel base, 10 ft. 2 in., wheel centers 44 in. in diameter. Most modern locomotive receiving general overhauling.
1—18x24, 10-wheel Baldwin, weighing 54 tons, with 42 tons on drivers; steam pressure 180 lb., diameter of driving wheel centers 50 in., rigid wheel base 13 ft. 10 in., overhauled Oct., 1917. First-class condition.
2—Standard gage 10x16 Davenport Saddle tank locomotives, weighing 19 tons, 1 65 lb. steam pressure, steam brakes and automatic couplers; locomotives built in 1917. Good as new.
2—Standard gage Davenport Saddle Tank Locomotives, weighing 18 tons, 150 lb. steam pressure, steam brakes and automatic couplers.
10—36-in. gage, 10x16 and 9x14 Davenport saddle tank locomotives.

### RAIL, SWITCHES, SPIKES, ETC.

1—Carload 4½-in., 5-in. and 5½-in. spikes.
10 tons angle bars for 70-lb. and 75-lb. rail.
10 tons 20-lb. rail with splices.
40 tons 52-lb. rail.

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3—Brownell, 72 in. x 18 ft. Horizontal Tubular Boilers, with 4-in. tubes.
2—20 x 22¼ x 14¼ x 21 AA2 Ingersoll-Rand Compressors, complete with fittings.
1—20 x 22¼ x 15¼ x 21 AA1 Ingersoll-Rand Compressor.
1—66 x 18 Vertical air receiver, complete.
1—30 x 6 Vertical air receiver, complete.
1—16 x 16 x 18-in. Laidlaw-Dunn-Gordon Air Compressor with reservoir, weight 15,000.
1—Stationary Engine; horizontal center crank type; 10 x 12 in. cylinder, slide valve type; 25 hp.

## CLAPP, NORSTROM & RILEY EQUIPMENT CO.

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An experienced master mechanic who has had charge of crushing, grinding, screening and burning machinery similar to that used in the manufacture of cement. Address, with experience and salary expected, Box W. W. W., care Cement & Engineering News, 672 Transportation Building, Chicago, Ill.

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Wanted, for large cement plant, chief engineer familiar with Corliss engines and all power house equipment. Must have thorough knowledge of stokers and combustion of fuel. Please state age, position in draft, previous experience, references and salary expected in first letter. Address Box 69, care Cement & Engineering News, 672 Transportation Building, Chicago.

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| 1— 3 | —General Electric.... | 1800 |
| 1— 3 | —Westinghouse ..... | 1200 |
| 1— 5 | —Wagner ..... | 1800 |
| 1— 5 | —Allis Chalmers..... | 1200 |
| 1— 7½ | —General Electric.... | 1800 |
| 1—10 | —Westinghouse ..... | 900 |
| 2—15 | —Westinghouse, Type CCL ..... | 1750 |
| 2—15 | —Watson, slip-ring, var. speed..... | 1720 |
| 1—15 | —Fairbanks-Morse .... | 1200 |
| 1—15 | —General Electric, Form L..... | 1200 |
| 1—15 | —General Electric.... | 1200 |
| 3—15 | —Fairbanks-Morse, slip-ring, constant speed ..... | 1200 |
| 1—15 | —Westinghouse, vertical ..... | 1135 |
| 2—15 | —Allis-Chalmers ..... | 1130 |
| 2—15 | —Allis-Chalmers ..... | 860 |
| 2—15 | —Westinghouse ..... | 850 |
| 4—20 | —Westinghouse ..... | 1750 |
| 1—20 | —General Electric.... | 1200 |

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This Ball Mill has never been used. Complete with feeder, charge of balls and driving pulley. Price $4,500.00 for immediate sale. Address Box 142, c/o Cement & Engineering News, 672 Transportation Bldg., Chicago, Ill.

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by large Cement Manufacturing Company. None but qualified, A-1 man who can and will make good need apply. Give references and state salary expected. Address, Box No. 690, care of Cement & Engineering News, 672 Transportation Bldg., Chicago.


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| | Price |
|---|---|
| 1—12x12 Laidlaw-Dunn Gordon, belt driven, capacity 300'..... | $ 750 |
| 1—12x12x16 Ingersoll, straight line, steam driven, capacity about 300' at 80 to 100 lb..... | 600 |
| 1—Sullivan, 2 stage air, simple steam, capacity 1800' at 80 to 100 lb..... | 2,500 |
| 2—14x12 Bury Duplex, belt driven, capacity about 550' at 60 to 80 lb., each | 1,000 |
| 1—14x16x10x16 Sullivan, 2 stage air, simple steam, capacity 600' at 80 to 100 lb. ..... | 1,500 |
| 1—14x9x10 Bury, 2 stage, belt driven, capacity 350' ..... | 1,500 |
| 1—Ingersoll-Rand Imperial Type XB2, 500' ..... | 2,000 |
| 1—Sullivan 2 stage, belt driven, 1400' good as new, f. o. b. St. Louis..... | 4,500 |

### CARS

| | |
|---|---|
| 20—4 yd. Western, 2 way, contractors, 36" gauge, wooden bodies, each... | $ 125 |
| 70—2½ yd. steel bodied, end dump quarry cars, 36" gauge, each..... | 80 |
| 30—2½ yd. steel bodied, end dump quarry cars, 48" gauge, each..... | 75 |
| 20—12 yd. Western, standard gauge MCB, air dump cars, almost new, each ..... | 1,050 |
| 20—12 yd. Western, standard gauge MCB, air dump cars, good condition, each ..... | 900 |
| 50—1½ yd. Koppel "V"-shaped, 24" gauge, steel cars, new, each..... | 120 |

### CRUSHERS

| | |
|---|---|
| 1—No. 9 Style "K," almost new..... | $7,000 |
| 2—No. 5 Austins, one straight and one angle drive, both fine condition, each | 1,500 |
| 1—No. 6 Style "D" Gates, fine condition ..... | 2,000 |
| 1—No. 7½ Austin, almost new..... | 2,500 |
| 1—10x20 Blake jaw crusher on skids... | 800 |
| 1—9x16 Good Roads Machinery, jaw crusher on wheels, with 22' elevator. | 800 |
| 1—9x16 Universal on skids, almost new. | 500 |
| 1—No. 7½ McCully ..... | 3,000 |
| 1—No. 5 McCully ..... | 1,500 |

### ELEVATOR AND SCREENS

| | |
|---|---|
| 1—No. 5 Gates 70' centers, almost new. | $ 700 |
| 1—No. 7½ Austin 62' centers, fine condition ..... | 900 |
| 1—No. 9 with 36" buckets, good condition, without belt..... | 900 |
| 1—Stephens & Adamson stone screen, 42"x16', with dust jacket, practically new ..... | 700 |

| | Price |
|---|---|
| 1—48x18 Austin screen with dust jacket | 800 |
| 1—48x20 McCully screen with dust jacket ..... | 900 |

### CLAM SHELL BUCKETS

| | |
|---|---|
| 1—¾ yd. Owen with teeth, almost new | $450 |
| 1—1½ yd. Hayward, first class..... | 650 |
| 1—1 yd. Browning..... | 500 |
| 1—1½ yd. Page Dragline..... | 500 |

### CRANES

| | |
|---|---|
| 1—7 ton, 4 wheel Vulcan Bucyrus single line crane.....$ | 6,000 |
| 1—10-ton Browning 4 wheeled, with bucket ..... | 7,000 |
| 1—15 ton Brown hoist, with 50' boom, 8 wheeled MCB, with 2 yd. Brown hoist, clamshell ..... | 17,500 |
| 1—20 ton Brown hoist, 8 wheel MCB, 50' boom, and bucket..... | 18,000 |
| 1—25 ton Browning hoist, 8 wheel MCB, 50' boom, and bucket..... | 21,000 |

### HOISTING ENGINE

| | |
|---|---|
| 1—6¼x10 American DCDD, with boiler. | $1,000 |
| 1—7x10 Lidgerwood DCDD, with boiler | 1,100 |
| 1—7x10 Lambert, 3 drum, with boiler... | 1,600 |
| 1—8x12 Mundy DCDD, with boiler.... | 1,300 |
| 1—9x10 Lidgerwood, 3 drum, 32" drums, without boiler ..... | 1,900 |
| With boiler ..... | 2,300 |
| 1—Clyde 9x10, 3 drum with boiler, f. o. b. Mich. ..... | 2,500 |
| 1—5x8 DCDD Reversible O&S, with vertical engine, without boiler..... | 350 |
| With boiler ..... | 550 |
| 1—7x10 Lambert DCDD, with boiler... | 1,100 |

### LOCOMOTIVES

| | |
|---|---|
| 1—9x14 Vulcan, 36" gauge, saddle tank. | $1,250 |
| 1—9x14 Vulcan 36" gauge, saddle tank. | 1,350 |
| 1—10x16 Vulcan 36" gauge, saddle tank. | 1,600 |
| 1—10x16 American 36" gauge, saddle tank, good as new..... | 1,850 |
| 1—19x24 Baldwin, 10 wheeler, 60 tons. | 8,000 |
| 1—18x24 American, 10 wheeler..... | 5,000 |
| 1—17x24 6 wheel switcher..... | 5,000 |
| 1—14x24 Pittsburgh, saddle tank standard gauge with separate tender..... | 4,000 |

### DRAGLINES

| | |
|---|---|
| 1—Monighan-Walker steam machine, with 50' boom, 1½ yd. bucket, almost new .....$ | 7,000 |
| 1—Flory outfit engine 10x12 heavy dragline type boiler, fire box 150 lb. pressure, boom 60', steel bucket, 2 yd. New 1917 ..... | 9,000 |
| 1—24 Bucyrus, with 85' boom..... | |

### RAIL

| | Price |
|---|---|
| 400 tons—35 lb., with angle bars..... | $57 |
| 1500 tons—56 lb., with angle bars..... | 58 |
| 100 tons—75 lb., with angle bars..... | 55 |

### PUMPS

| | |
|---|---|
| 1—10" Morris, sand, belt drive.....$ | 500 |
| 1—8" Morris, water, belt drive..... | 300 |
| 1—20x10x14 Worthington duplex..... | 600 |
| 1—Wilson-Snyder water works pump, complete with condenser..... | 2,000 |

### STEAM SHOVELS

| | |
|---|---|
| 1—No. 0 Thew on standard gauge railroad truck, ⅝ yd. dipper.....$ | 2,500 |
| 1—No. 0 Thew traction with ⅝ yd. dipper, fine condition..... | 4,000 |
| 1—14B Bucyrus traction with ⅝ yd. dipper, almost new..... | 4,000 |
| 1—18B Osgood traction with ¾ yd. dipper, high boom, one year old..... | 5,000 |
| 1—No. 1 Vulcan revolving shovel, standard gauge with ¾ yd. dipper, good as new ..... | 4,500 |
| Same as above, with 35' crane boom | 5,500 |
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| 1—Model 60 Marion with 2½ yd. dipper | 7,000 |
| 1—65 ton Bucyrus with 2½-yd. dipper.. | 5,000 |

### CABLEWAYS

| | |
|---|---|
| 1—9x10 Lidgerwood, 3 drum engine and boiler and carriage and part of other fittings, no rope.....$ | 3,000 |
| 1—50 hp. Flory DD electric with carriage and fittings, but no rope..... | 3,000 |
| 1—7x10 Flory steam DCDD with boiler, carriage and all fittings, but no rope | 1,950 |

### BOILERS

| | |
|---|---|
| 1—25 hp. vertical American hoist and derrick ..... | $250 |
| 1—40 hp. firebox on steel truck..... | 550 |
| 1—50 hp. vertical butt strap ..... | 750 |
| 1—60 hp. vertical Lidgerwood ..... | 800 |

### MOTORS

| | |
|---|---|
| 1—20 hp. Westinghouse, 60 cycle, 3 phase, 220 volt..... | $400 |
| 1—30 hp. Westinghouse, 60 cycle 3 phase, 2200 volt..... | 450 |
| 1—35 hp. Westinghouse, 60 cycle 3 phase, 2200 volt..... | 500 |
| 1—50 hp. General Electric, 60 cycle 3 phase, 220 volt..... | 750 |

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# Complete Road Builders' Outfit For Sale

1—20 hp. Reeves Engine.
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7992 lin. ft. Heltzel Pat. Steel Forms, 6 in. high.
56 doz. Heltzel Pat. Hanging.
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1—Warehouse Truck, Fairbanks.
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1—No. 3 C. H. & E. Piston Force Pumps, 2½ in. disch.
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6—No. 3 Drags, Westerns.
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1—24 in. Disc.
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2—Western Rooters, No. 20.
1—Western Rooter, Giant.
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1—Automatic Trip Jack.
4—Western Portable Telescoping Bins, 20-yd. cap.
1—Owen Clamshell Bucket, ¾ yd.

The above equipment is located in Illinois, and at Granite City, Illinois, and St. Louis, Mo.
Prices Quoted are F. O. B. Cars at point of shipment.
Terms: Sight draft attached to bill of lading or terms on approved credit.
The equipment is in first-class working condition for used outfits, and is subject to inspection at point of shipment.
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Bonnot Co.
Bradley Pulverizer Co.
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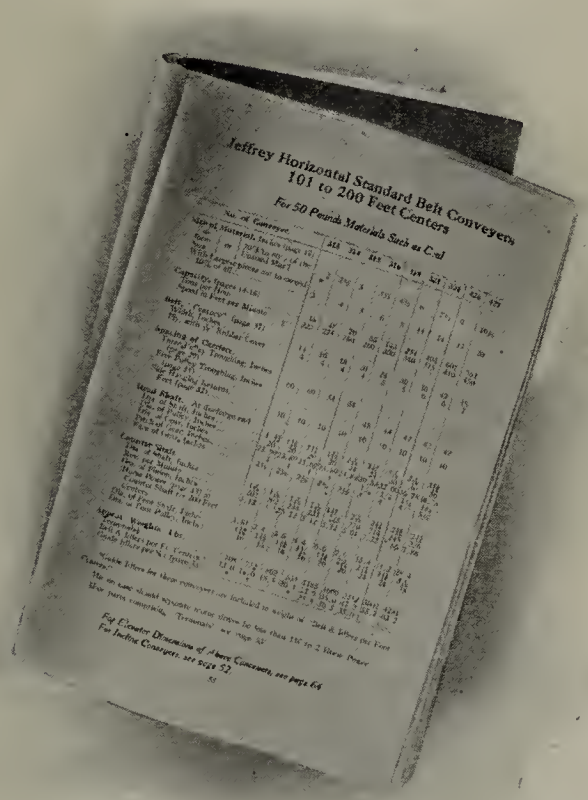
# There's a Valuable Book—

## For the Busy Engineer, Contractor or Manufacturer

A complete text book upon the Belt Conveyer. In addition to fully describing the advantages of using the Jeffrey Belt Conveyer, it thoroughly covers in every detail, the purchaser's requirements for information upon those elements in the application of the Belt Conveyer which mean for satisfactory service.

Here are some of the interesting subjects, the best in Belt Conveyer practice which have been collected and printed in this catalog:




Early Type of Belt Conveyers
Improvements in Type for Better Service
Industries using Belt Conveyers
Typical Applications of Belt Conveyers
Condensed Data for the Busy Engineer
Belt Tension and Horse Power Pull
General Tables of Belt Capacities
Belting Facts in Widths, Plys and Covers
Protecting the Life of the Conveyer Belt
Curve of Belt from Horizontal to Incline
Various Forms of Belt Conveyer Drives
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Rules for Using "Standard" Conveyers
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Jeffrey Belt Conveyers in many Industries

*Return the Coupon TODAY*

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The Jeffrey Mfg. Co., Columbus, Ohio.
Please send your Standard Belt Conveyer Catalog No. 175.

I am interested in handling.....

Name .....

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Cement and Engineering News
One of the specification pages of the new catalog.

# CEMENT AND ENGINEERING NEWS

with which Gravel & Stone Magazine is incorporated

(PUBLISHED MONTHLY)

William Seafert, *Publisher and Editor*
J. F. Waldron, *Advertising Manager*
R. M. McCully, *Business Manager*

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DISCONTINUANCES—The greater part of our subscribers prefer NOT to have their subscriptions interrupted, in case they fail to remit promptly for renewal. It is therefore assumed, unless notification is given to the contrary, that the subscriber wishes to continue taking our paper. Therefore CEMENT & ENGINEERING NEWS will be sent until we are notified to discontinue—Such notice should be sent when the subscription expires.

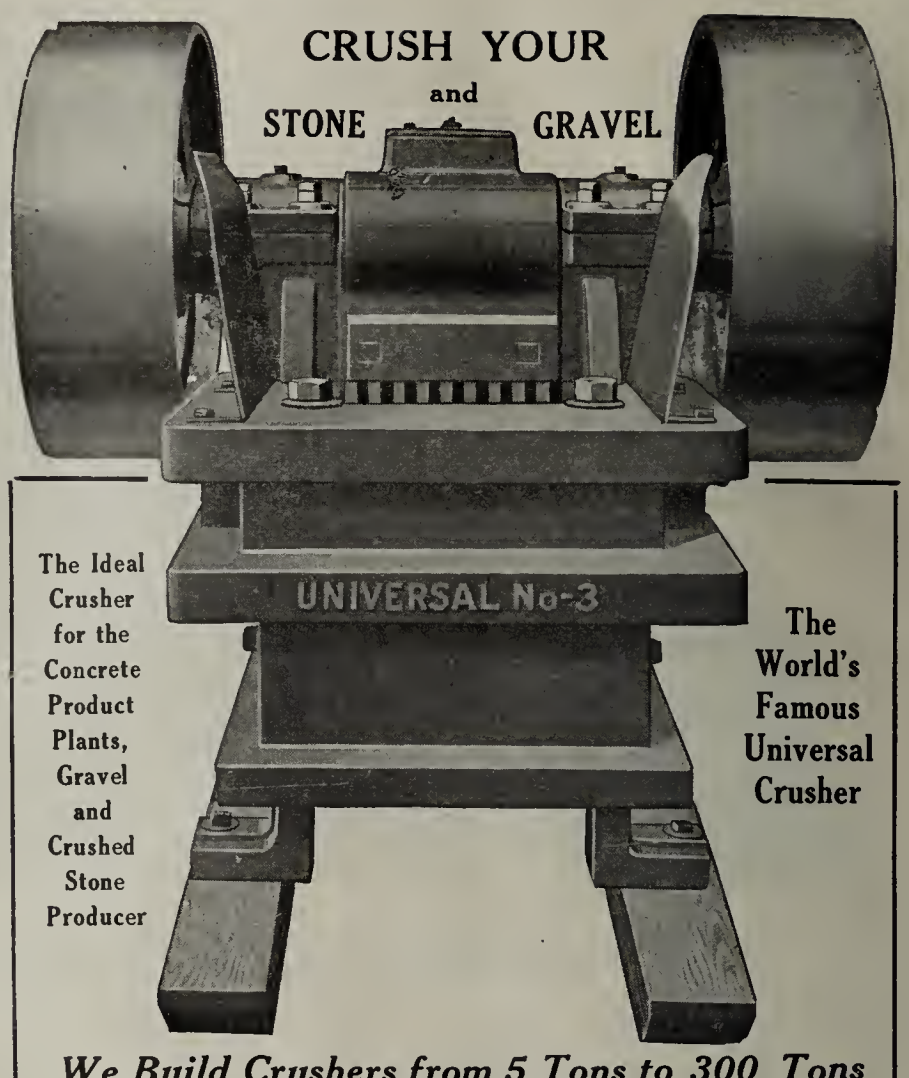
Advertising copy or changes in ads. must be in this office by the 25th of each month, as hereafter our magazine will appear on the 5th of the following month

Advertising Rates Sent on Application

Vol. 30 CHICAGO, DECEMBER, 1918 No. 12



CRUSH YOUR STONE and GRAVEL




The Ideal Crusher for the Concrete Product Plants, Gravel and Crushed Stone Producer

The World's Famous Universal Crusher

*We Build Crushers from 5 Tons to 300 Tons per 10-hour Capacity*

Instantly adjusted to produce size required from ¼ inch to 3 inches. *Write for Folder No. 14.*

UNIVERSAL CRUSHER COMPANY
230 Bee Ave Cedar Rapids, Iowa, U. S. A.

**Henry Heil Chemical Company**
**210 to 214 South Fourth Street, ST. LOUIS, MO.**

We make a specialty of supplying cement works with

**Chemical Apparatus, Chemicals and Reagents**

Gilmore's Needles, Cement Moulds, Vicat Apparatus, Schumann's, LeChatelier's and Jackson's Specific Gravity Apparatus, Etc.

**Pyrometers, Calorimeters**
**High Grade Goods Only**

*Satisfaction Guaranteed*

NEXT SEASON

The demand for monolithic concrete grain bins, water towers, coal pockets, silos and silo-water tanks will be big. The concrete contractor who wishes to be prosperous next year will prepare to meet that demand. The way to start is to investigate the POLK SYSTEM of monolithic concrete construction. Ask for our latest catalog.

Polk Genung Polk Company
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Maximum production and quality are assured wherever Vulcan Kilns are installed.

We are kiln specialists. We design and build special or standard types to meet specific requirements. We also develop new ideas for their use.

Forty years of study, labor and experimenting have brought "Vulcans" to their inevitable position—the most widely used kiln in America.

Our engineers are ready and willing to assist and advise you. Vulcan manufacturing facilities and skilled workmen are at your service.

*Write us now without pay or obligation. Your request will bring a fund of kiln information.*

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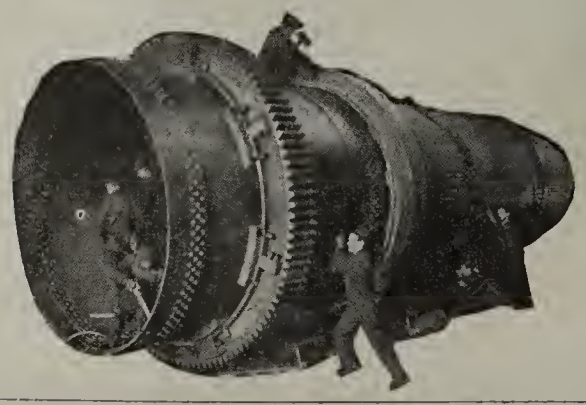
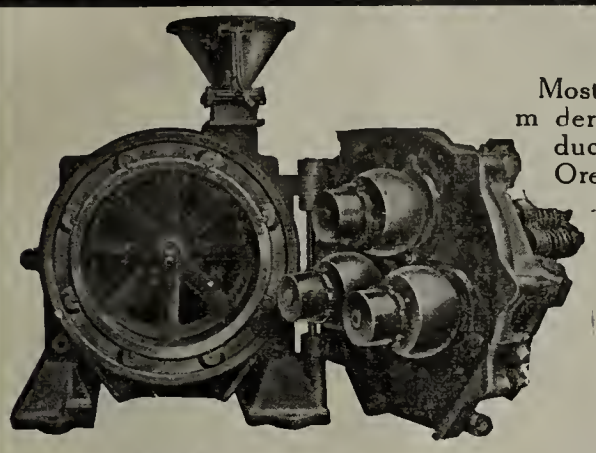
1740 Main St. Wilkes-Barre, Pa.



# STURTEVANT MILL CO.

**HARRISON SQUARE - - BOSTON, MASS.**



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### RING-ROLL PULVERIZERS

Most durable and efficient grinder for hard and moderately hard rock or ore. Used for the reduction of Cement-Clinker, Limestone, Quartz, Ores, Granite, Trap, Phosphate, Coal, etc., etc. Hundreds in use.

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### NEWAYGO SUPER-SCREENS

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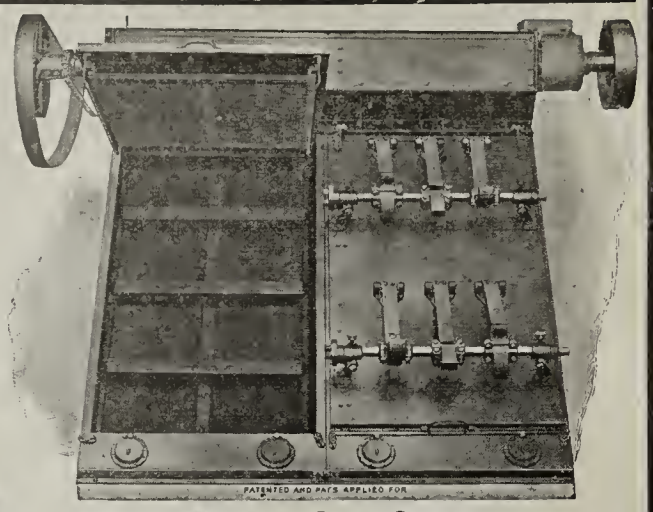


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The greatest producers known on Limestone, Lime, Shells, Chemicals, Talc, Clay, Chalk, Bark, Rosin, Sulphur, Coal, Salt, and many other moderately hard and soft materials. High Speed Pulverizers, crushing by a series of blows delivered at high speed against the material fed into the machine.

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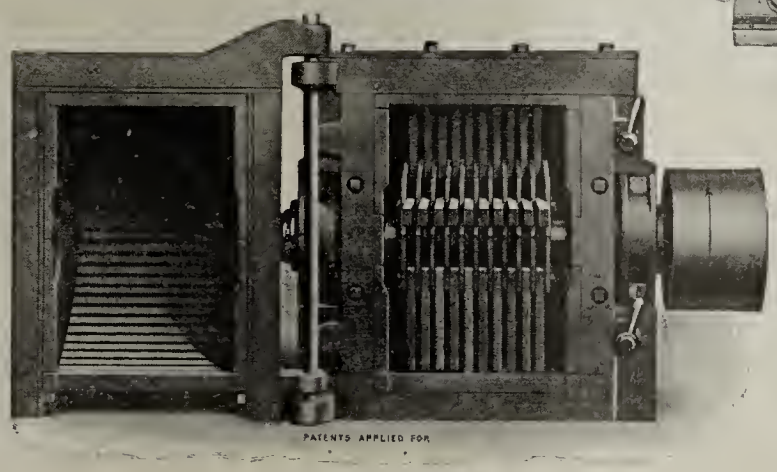



Swing-Sledge Mill

**WE MAKE THE**

## LARGEST COMPLETE

**LINE OF**

**CRUSHING, GRINDING, SCREENING, WEIGHING, SACKING, ELEVATING AND MIXING MACHINERY**

## IN THE WORLD

**Send for Condensed Circular No. 60**

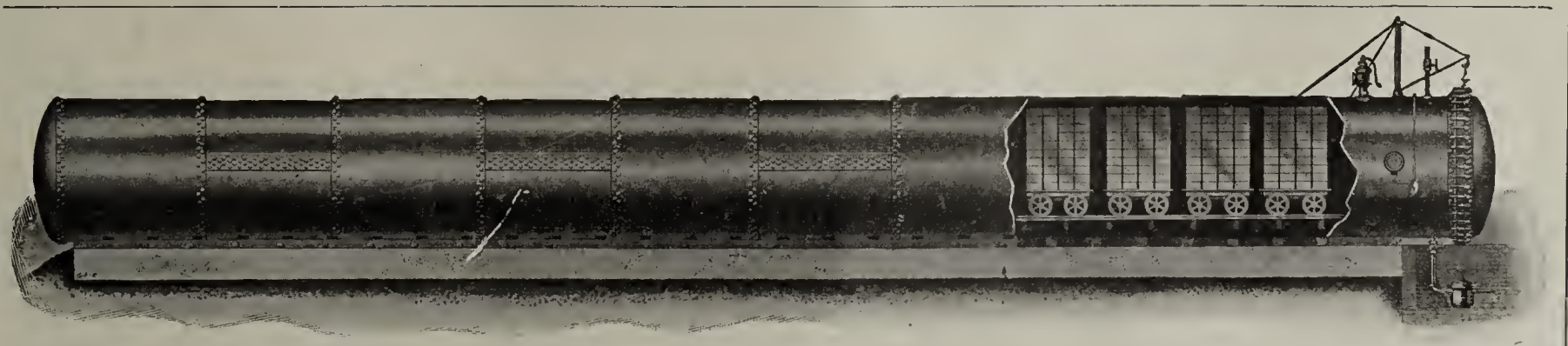
# Sand Lime Brick Machinery

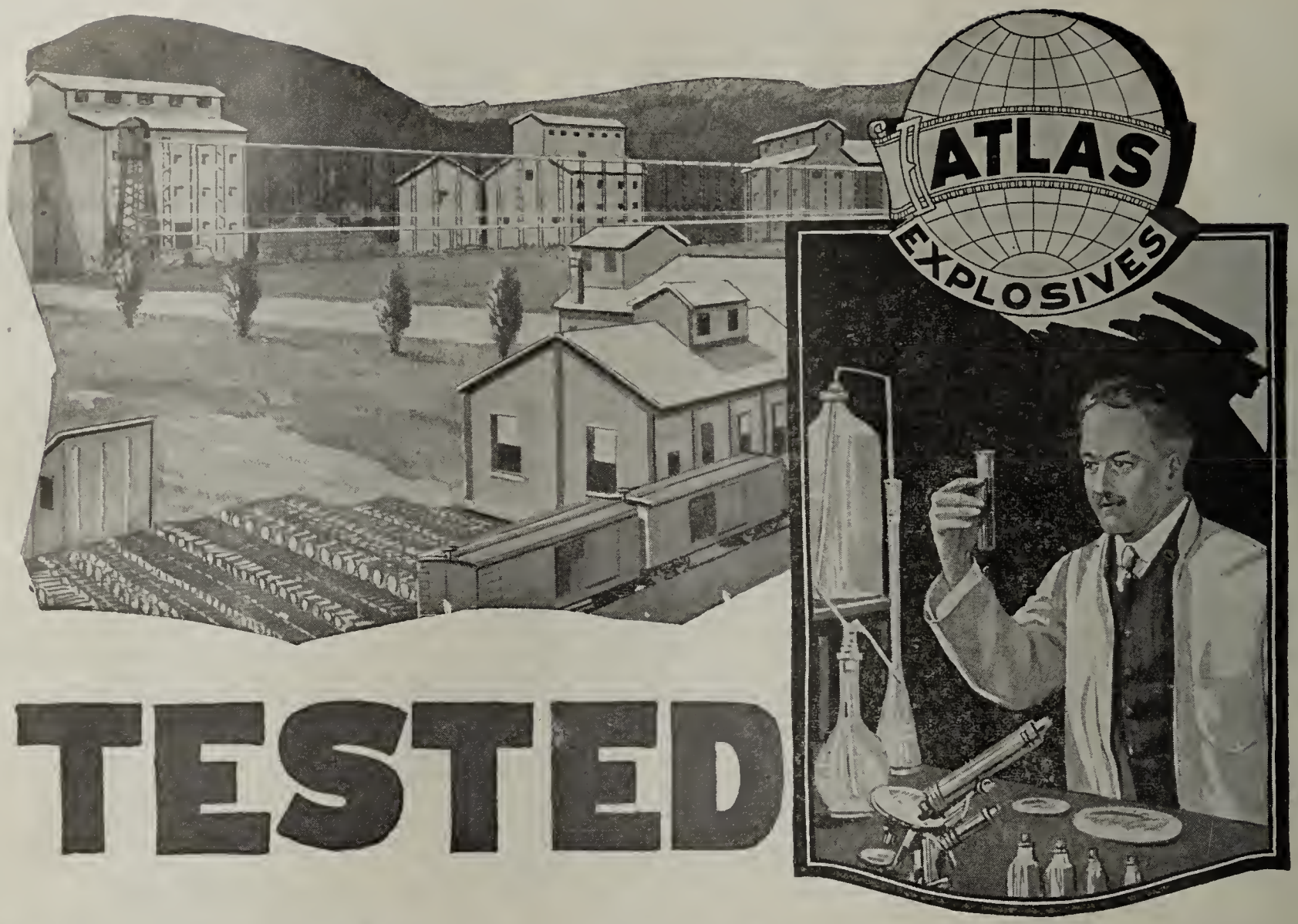
Our complete line of Sand Lime Brick Machinery makes it possible to secure just that machinery which is required to make your plant a success. We favor no particular type of machinery but are guided by the needs of the customer. Our wet and dry grinding mills have transformed a number of unsuccessful plants into dividend producers, while our Presses, Mixers, Hardening Cylinders and other equipment are of equal quality. We can exactly meet the demands of any manufacturer with a quality of machinery which will operate at a profit with a minimum amount of attention and expense.

*Correspondence solicited*

## The American Clay Machinery Co.

**WILLOUGHBY, OHIO**



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## *Every pound assures uniform blasting results*

Our interest in our product does not end when it leaves our plants. That is when our *real* interest *begins*.

We want ATLAS Explosives to do more and better work in actual service. We want the blasting of our customers to be more efficient and more economical.

That is why our entire nation-wide organization is a unit for service to every man who has to do with blasting.

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Founded on this known uniformity ATLAS service is a sure cure for blasting ills. We invite every man interested in blasting to test this service.

**Put your blasting problems up to us**

Our Service Department is a clearing house of blasting experience in all its phases and under all conditions. It is directed by experts who will personally help you apply this vast store of information to *your own blasting*. WRITE TODAY.

## ATLAS POWDER COMPANY

**Home Office: Wilmington, Del.**

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**A PROPER EXPLOSIVE FOR EVERY BLASTING REQUIREMENT**

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## A COMBINED CENTERING AND REINFORCING

## Gives Splendid Results in Bath-house Construction at Fort Phoenix

Bath-houses owned by the Union Street Railway Co of New Bedford, Mass, have roofs, walls and partitions of concrete, reinforced in every direction by the Ribplex which also served as centering and studding.

***Ribplex has a wide range of use in light, permanent, fire resistive roofs, walls, floors and partitions, in all sorts of structures.***

**We invite correspondence - Address Dept. K 60**

BERGER

## The Berger Mfg. Co., Canton, Ohio

**Branches:** Boston, New York, Philadelphia, Chicago, St. Louis, Minneapolis, San Francisco

**Export Dept.: Berger Building, New York City, U. S. A.**

$\frac{15}{16}$ IN. HY-RIB (SEVEN-RIB). Ribs $\frac{15}{16}$ in. high, 4 in. apart; sheets 24 in. wide.

# Insure Your Building Results

by using the complete line of material for use in all types of construction. Be sure of prompt delivery, as our complete stocks and large organization warrant immediate shipment.

## HY-RIB and RIB LATH

the acknowledged standard material, as used everywhere in all kinds of construction work.

The many depths, gauges and types of Hy-Rib adapt it to reinforcement of concrete floors and roofs. It is an ideal plastering surface for walls and ceilings and renders the building entirely fireproof. Easily put in place and on arched and curved work it is furnished bent to the exact curve.

Our complete line includes, in addition to the above, Diamond Lath in two types; Pressed Steel Channels and Studs of all varieties; four types of Corner Beads; three types of Base Screeds, etc. Send for free Hy-Rib Hand Book.

**For Concrete Roads**

Kahn Road Mesh
The most efficient reinforcement for concrete roads and pavements.

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Protect and reinforce concrete curbs.

Kahn Armor Plates
Perfectly protect expansion joints.

Write for Highway Pamphlet and estimates.

## TRUSCON STEEL COMPANY, Youngstown, Ohio

***Representatives in Principal Cities***

It's a
"LONGLIFE"
CONVEYOR BELT
-the belt you need now
and will eventually buy
MADE BY
THE B.F.GOODRICH COMPANY
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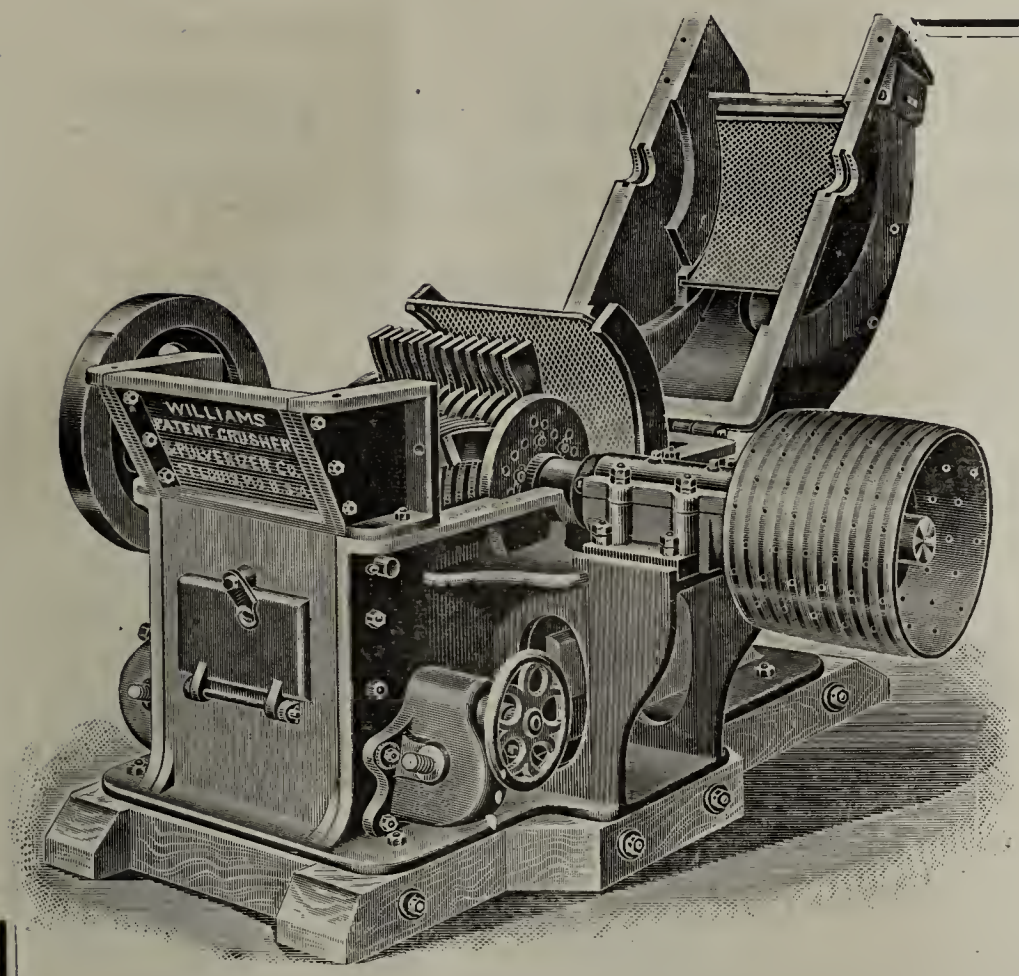


# WILLIAMS
# LIMESTONE GRINDERS

**Take 2 in. to 3 in. dry stone and in one operation, without outside screens or separators will produce 95% through 20-mesh material.**

**CAPACITIES RANGE FROM ¼ TO 30 TONS PER HOUR**

**Over 5,000 Williams Mills in Daily Operation.**

There is undoubtedly room in your plant for one of these machines, which, in the last twenty-two years have proven that they are money savers, can be depended on, and really have merit. If further information is desired, Write for Bulletin No. 17, which is brim full.

## THE WILLIAMS PATENT CRUSHER & PULVERIZER COMPANY

**General Sales Dept.—37 West Van Buren Street**
**CHICAGO**

**Plant**
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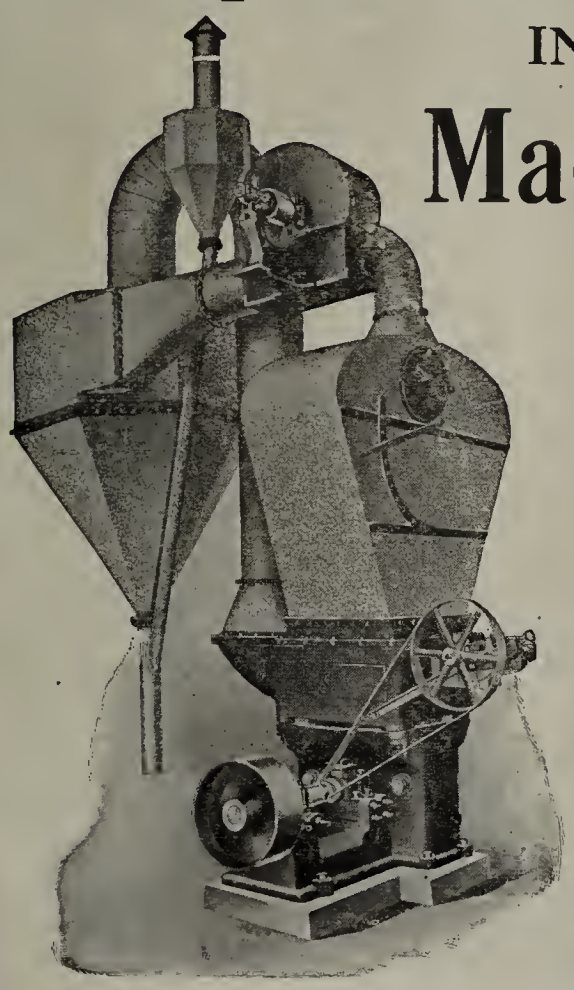
**67 Second St.**
**SAN FRANCISCO**

# Complete Grinding IN ONE Machine



In successful use grinding Cement, Clinker, Limestone, Coal

INSTANT REGULATION OF FINENESS

NO DUST

*Send for Circular*

## THE BONNOT CO.
CANTON, OHIO

# GRANOLITHIC

**A superior, colorless, Liquid Cement Hardener**

**GRANOLITHIC** makes cement floors Wear Proof—Dust Proof and Water Proof. The dust that is so injurious to merchandise, machine bearings and motors is eliminated. The cost of treating cement with **GRANOLITHIC** is trifling compared to the economies effected.

Unsolicited testimonials tell the story. Write for full particulars today.

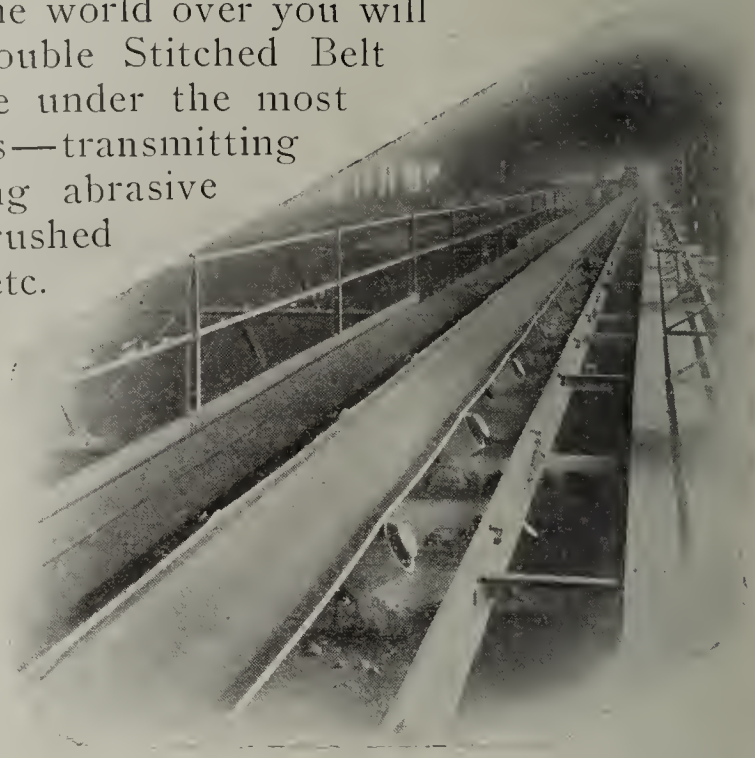
## GRANOLITHIC COMPANY, Inc.
**471 N. Snelling Ave., St. Paul, Minn.**

Midway

LIQUID *CEMENT* FLOOR HARDENER

# This belt is built to meet just such wearing conditions as you have in your cement plant

In mines and mills the world over you will find Black Giant Double Stitched Belt giving record service under the most severe conditions—transmitting power and conveying abrasive materials such as crushed stone, sand, gravel, etc.



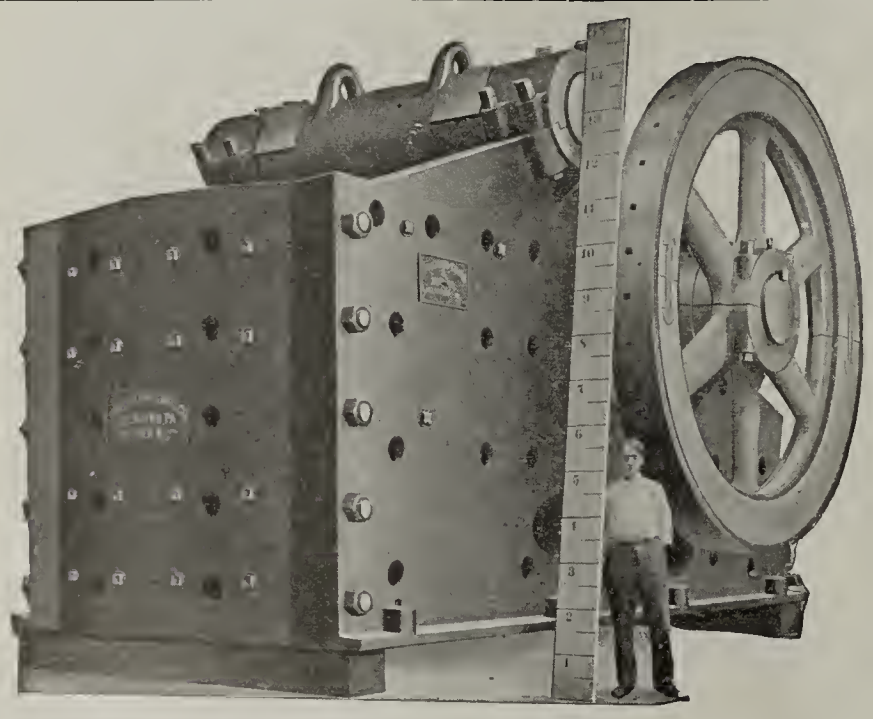
***Two cement companies alone bought during 1917 over Fifty Thousand Dollars' worth of Black Giant Double Stitched Belt.***

We would like an opportunity to demonstrate in your mill that this belt—because of its special construction and the compound with which it is treated—will give you better service.

## McILROY BELTING & HOSE CO.

**Hammond, Indiana**

Black Giant Runs True and Even—No Spillage.



Traylor 60"x86" All Steel Jaw Crusher

## TRAYLOR JAW CRUSHERS

**Are Built in All Sizes from 7″x10″ to 66″x86″**

The 66"x86" is the largest crusher built.

All Traylor Jaw Crushers have cast steel water cooled pitmans.

Extra size pitman and swing jaw shafts of finest hammered steel.

Chrome steel toggle seats.

Manganese steel or chilled iron jaw plates.

# TRAYLOR BUILT MACHINERY

## A CRUSHER FOR EVERY PURPOSE

***We Make***

In addition to **JAW CRUSHERS** illustrated

### The Traylor Gyratory Crusher

The last word in Gyratorys.

### The Traylor Crushing Rolls

They eliminate the personal equation in automatically preventing tire corrugations.

### The Traylor Tube Mills

Long or short for wet or dry grinding. Have water cooled bearings of extra size. Positive automatic feed that assures maximum tonnage for minimum horse power.

### The Traylor Ball Tube Mill

For reducing lumps to fines in one step.

## "THE ULTIMATE CRUSHING EQUIPMENT"

## TRAYLOR ENGINEERING & MANUFACTURING COMPANY

MAIN OFFICE AND WORKS: ALLENTOWN, PA., U. S. A.

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# Are You Prepared?

THE greatest building boom the world has ever seen is opening right now. Are you going to get **your** share of the business?

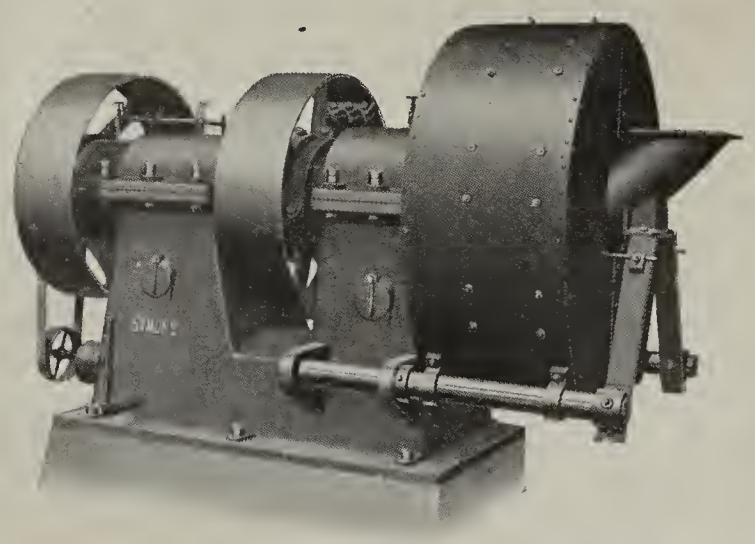
THE demand for crushed rock and gravel for road construction will tax the production capacity of every plant in America. The

## SYMONS DISC CRUSHER

is ready to help you meet these unusual conditions. Its installation in your plant means increased output—and increased output means a greater share of this new business for **YOU.**

SYMONS CRUSHERS are economical in power consumption—excel in low repair cost and assure you a uniform product at the lowest production cost.

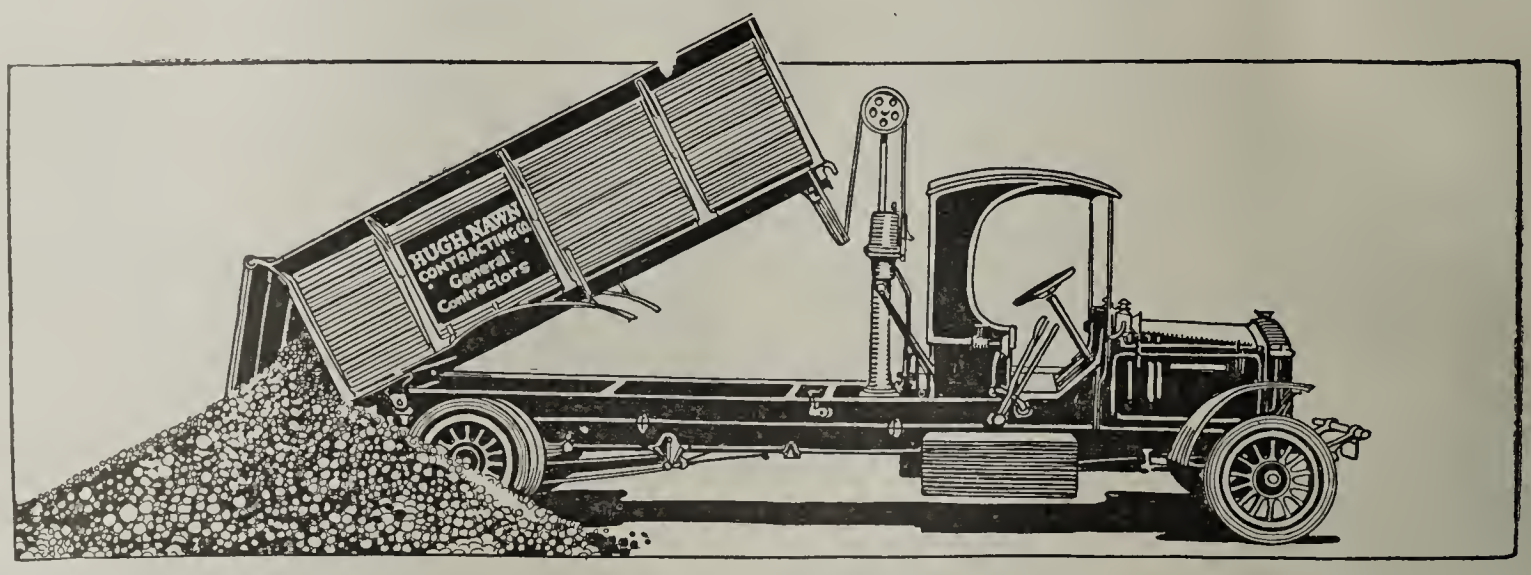
**Our catalog "R" describes them in detail. Write for it today.**



## Chalmers & Williams, Inc.

**1457 Arnold Street**

**CHICAGO HEIGHTS, ILL.**




# Hugh Nawn compares year's operating costs for two well-known makes of Motor Trucks

Hugh Nawn, the Boston contractor, long ago realized that motor trucks are the most efficient and economical hauling units for large operations. The only question in his mind was which is the best truck.

His choice finally narrowed down to two well-known makes, one the Pierce-Arrow, the other a competitive truck of high reputation. For one year these trucks were kept on similar jobs, both operating under the same accurate system of cost accounting. Neither truck was spared, and the severity of service in rush work is shown by the high tire cost for both trucks. As a result of the comparative showing tabulated below, Mr. Nawn is satisfied that the Pierce-Arrow is the best truck made for contracting business.

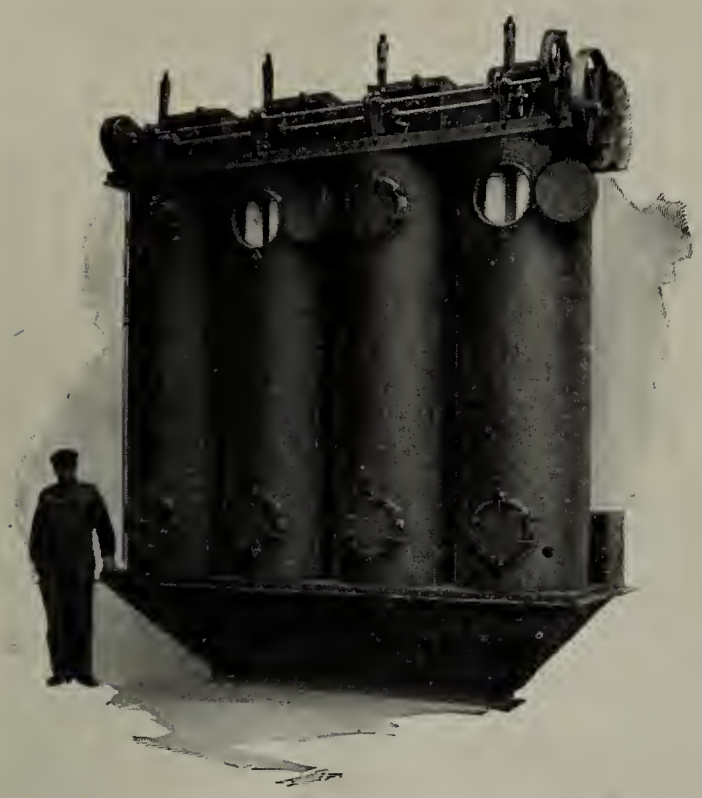
| COMPETITIVE TRUCK'S RECORD | | PIERCE-ARROW TRUCK'S RECORD |
|---|---|---|
| Miles Run | 13,095 | 15,517 Miles Run |
| Tonnage hauled | 10,768 | 11,013 Tonnage hauled |
| Gallons of gasoline consumed | 4,521 | 4,389 Gallons gasoline consumed |
| Pints of oil consumed | 1,176 | 385 Pints of oil consumed |
| Repairs to motor | $740.37 | $136.16 Repairs to motor |
| Labor repair cost | 249.25 | 152.91 Labor repair cost |
| Tire cost | 888.79 | 841.78 Tire cost |
| Year's operating cost excluding insurance, depreciation etc. | 3,520.27 | 2,768.96 Year's operating cost excluding insurance, depreciation etc. |
| Average operating cost per day including overhead | 19.80 | 16.78 Average operating cost per day including overhead |

A number of other interesting installations are shown in our booklet, "What Pierce-Arrow Motor Trucks Are Doing In The Contracting Business." We shall be glad to send you a copy.

THE PIERCE-ARROW MOTOR CAR CO., BUFFALO, N. Y.

# PIERCE-ARROW

*Motor Trucks*



# Safeguard Men and Machinery

Keep your workmen satisfied with working conditions and reduce maintenance costs of your machinery by using an

## ALLIS-CHALMERS DUST COLLECTOR

Its operation is effective and simple. The collection of dust is accomplished by filtering the air or fumes through cloth bags of special weave which are automatically cleaned at definite intervals discharging the residue into a hopper at the bottom of the machine.

*Write for Bulletin 1454*

Sales Offices in All Principal Cities

## ALLIS-CHALMERS MANUFACTURING COMPANY

Milwaukee, Wis.

*Our Name is Your Assurance.*

# ALLIS-CHALMERS

# HIGHWAY CONVENTION

Under the Auspices of the

## AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS

AND

## HIGHWAY INDUSTRIES ASSOCIATION

**DECEMBER 9, 10, 11, 12 and 13th, 1918**

# CONGRESS HOTEL

## CHICAGO

*ENGAGE YOUR ROOMS NOW*

The Congress Hotel and Annex is located on Michigan Boulevard—Chicago's most aristocratic thoroughfare, overlooking Grant Park and the broad expanse of beautiful Lake Michigan. Two minutes from the cities activities. A modern hotel at reasonable prices.

# The Bradley Hercules Mill

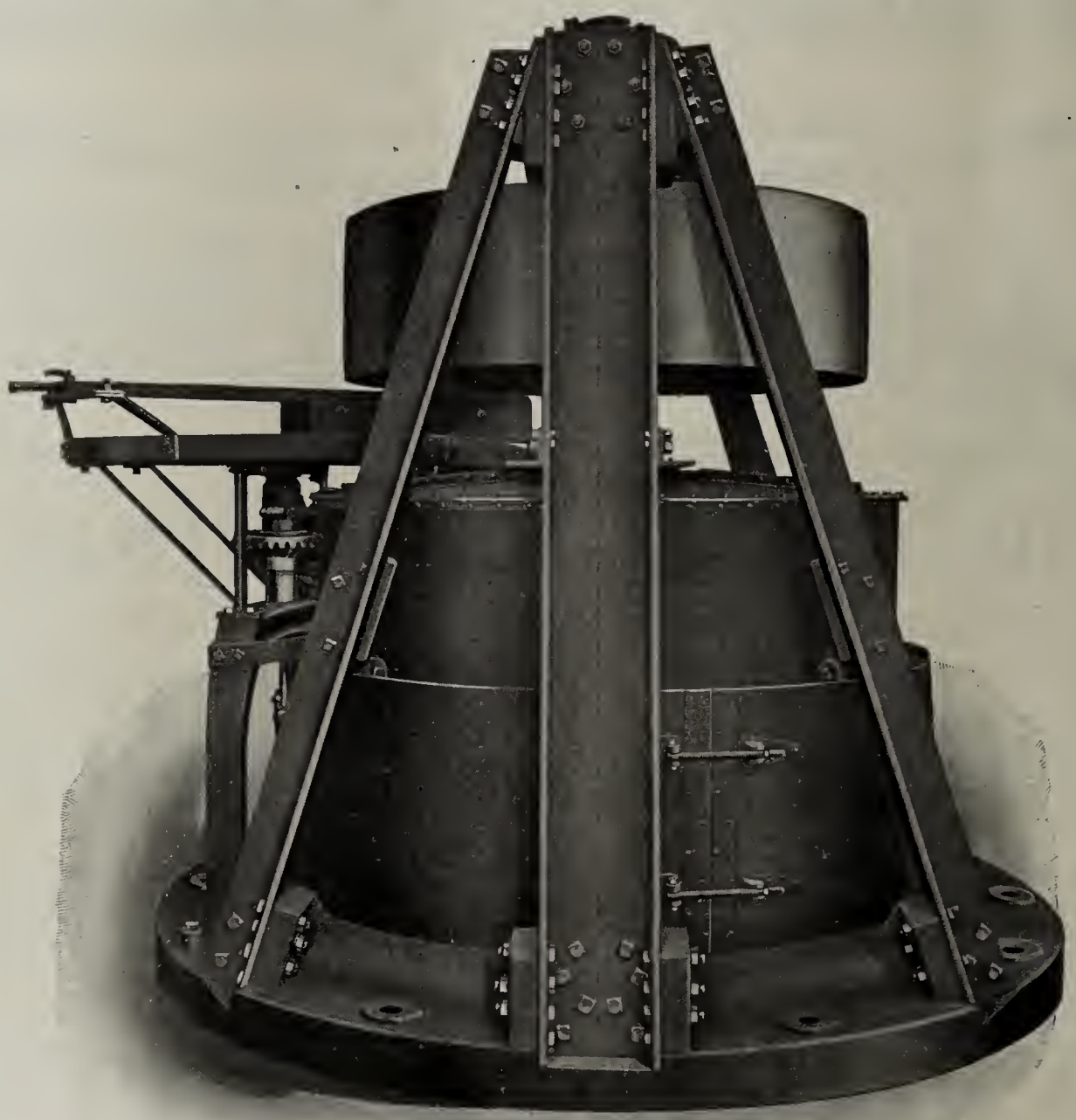
**This Latest Bradley Product is one worthy of investigation. Twenty-two of these big preliminary mills have been sold. No other new mill has ever equalled this sales record in such a short period.**

***THE BRADLEY HERCULES IS A PRELIMINARY PULVERIZER ONLY —NEVER SOLD FOR FINISHING CEMENT MATERIALS***

**But as a preliminary it is wonderful—five years in operation—not an experiment.**

**55-60% thru 100—35% thru 200—98% thru 20.**
**Limestone—30-40 tons per hour. Clinker 130-175 bbls. per hour.**

**Simple and economical in operation. Small power consumption per barrel.**
**Increases the output of any tube mill. Saves labor. Simplifies the plant.**



**Why not investigate? Is an efficient Agricultural Limestone Producer as well as Cement Material Reducer.**

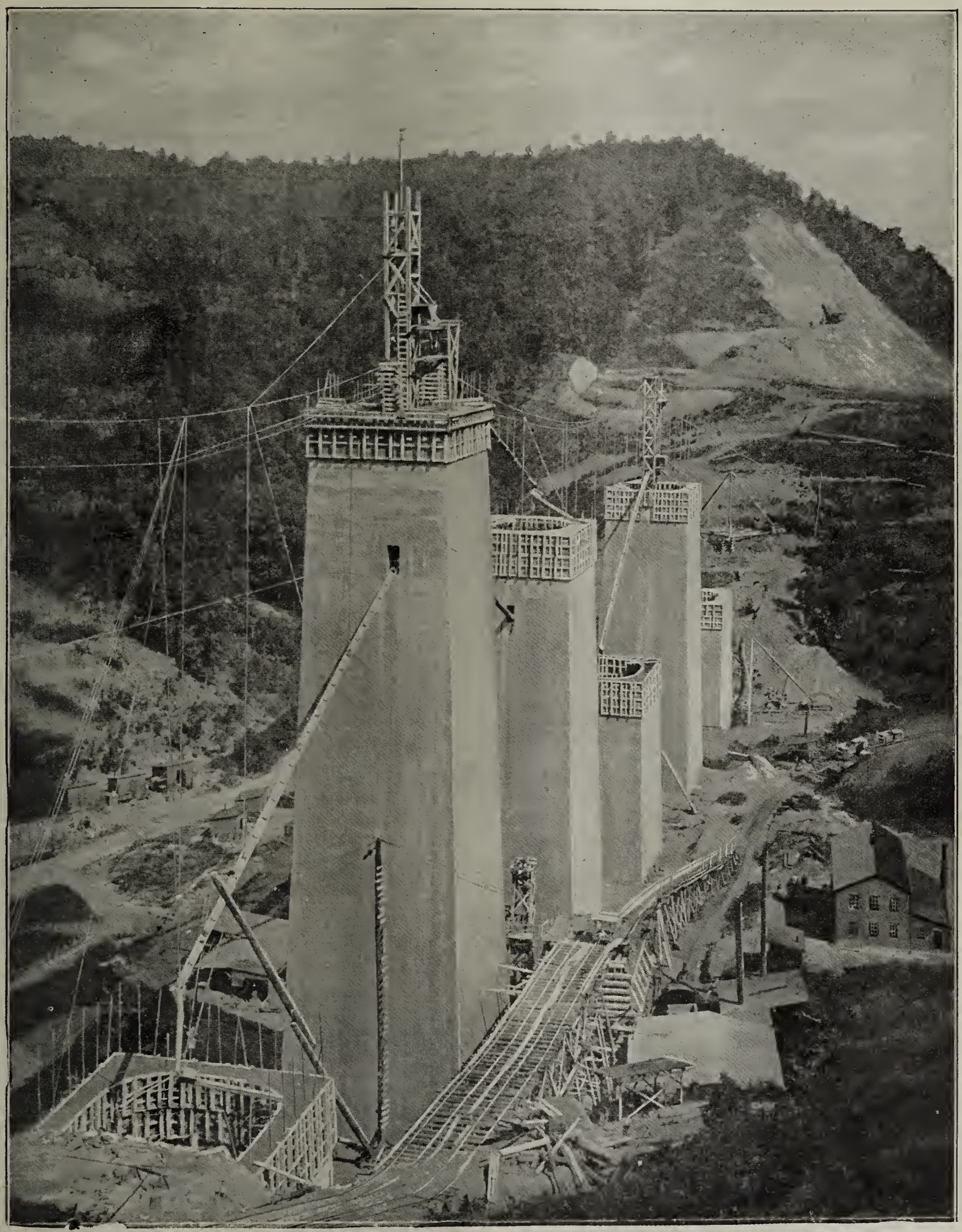
## Bradley Pulverizer Company

**Boston, Mass. London, England Works, Allentown, Pa.**

**Makers of the GIANT GRIFFIN AND BRADLEY 3 ROLL MILLS**

# Cement and Engineering News

Vol. 30 CHICAGO, DECEMBER, 1918 No. 12



North Broad River Viaduct, Toccoa, Ga. Has Eight Concrete Piers, About 200 Feet High. See Next Page

# Double Tracking the Southern Railway

By E. C. Ferriday

Several years ago it was decided by those to whom the affairs of the Southern Railway are entrusted that the double tracking of the Main Line between Washington, D. C., and Atlanta, Ga., was a necessity, not only on account of the tremendous traffic which was originating on its lines and being diverted to it by its connections, but in order to meet the demand of the north and south traffic as a result of the opening of the Panama Canal. All the principal north and south lines, such as the Louisville and Nashville, Cincinnati Southern and others, saw the necessity for double-tracking stretches of their main line, and the Southern Railway on account of its geographical position, the main artery between the North Atlantic Seaboard and the Gulf States, realizing the volume of traffic which would be passed over their lines, felt that the double-tracking of their main line was an absolute necessity.

While the Southern Railway had a great deal of double track on its main line, there were stretches in Virginia and the Carolinas and Georgia where they were operating over single track with much curvature and heavy grade, so in the late spring of 1914, under the direction of Major W. H. Wells, Chief Engineer, Washington, D. C., they embarked on a program of completing the double tracking of the entire line between Washington and Atlanta. This is now about completed, and from most of it they are deriving benefit not only in increased traffic, but in increased earning capacity.

In this vast amount of work the sixty-mile revision between Central, S. C., and Cornelia, Ga., is the last link, and will be completed when the section between Toccoa, Ga., and Ayersville, Ga., is finished.

This latter section of work was awarded C. W. Lane & Company, Atlanta, Ga., who have for years done work on the Southern Railway, Louisville & Nashville, Seaboard Air Line, The Virginian and other principal systems, to say nothing of individual enterprises for private corporations which they have executed from time to time, which work has been directly under the charge of Mr. C. W. Lane, with L. C. Harris superintendent and right-hand man.

This section is the heaviest piece of work ever undertaken by the Southern Railway Company. It reduces the mileage from 7.6 to 6.0 miles. The maximum curve on the old line is nine degrees, and the maximum grade is 1.3%, while on the new line the maximum grade is 1.00% and the maximum curve is 3%.

The original estimate for the section—Toccoa to Ayersville—called for 1,400,000 cubic yards of classified excavation and two steel viaducts, one at North Broad River 1,600 feet long and 210 feet high, and one at Coldazell Creek 2,800 feet long and 160 feet high. These were to be deck-plate girders resting on steel towers, but on account of the cost of structural steel and the uncertainty of delivery, plans were changed so as to require as little steel as possible.

It was then decided to fill over Coldazel Creek because a large amount of material could be obtained near the site. This fill required about 1,800,000 cubic yards. Two No. 73 Steam Shovels with 3½ yard dippers, and standard gauge 60-ton locomotives handling from seven to ten-car trains of Continental Dump Cars were used in its construction. The fill was made in forty-foot lifts.

At the south end of the fill the new line crosses the old line at an elevation of seventy-two feet above the old track. A temporary change was made here for about half a mile to reduce the difference in elevation in the two lines. This was done by using a 2% grade and making the summit at the crossing. The new track will have to be put into operation before the old track is abandoned. This will be done by spanning the old line with sixty-foot girders on pile piers. When the old track is removed this gap will be filled. This change was made to reduce the quantity of filling after the new track is in operation, and to shorten the time the temporary bridge will be used.

At the North Broad River it was decided to build hollow concrete piers with 100-foot steel deckplate girder spans between piers, and a 26-foot steel girder spanning the top of the piers. This change in plans called for about 45,000 cubic yards of concrete. There are eight hollow piers about 200 feet high. These are 30 by 34 feet at the top with ½-inch batter on the sides. The hollow inside is circular. The forms used are sectional and built of wood. These were designed by Messrs. C. W. Lane, of C. W. Lane & Company, Inc., Atlanta, Ga., and J. J. Gantt, Assistant Engineer of the Southern Railway. They are made interchangeable to reduce delays to a minimum. A cable way is used to handle forms.

The concrete is all placed by towers and chutes. The sand used in this work is obtained from Tungalo River, nine miles away, at which place C. W. Lane & Company have a sand dredge. The stone is obtained from a quarry about half a mile south of the bridge site.

One mile south of Ayersville, Ga., is the last cut on the section. This cut contained about 300,000 cubic yards, most of which was unusually hard rock, and would have been found to be very difficult to remove but for the use of the very high-grade explosives.

At one end of this cut the present main track crosses. In the middle of the cut was extremely hard rock, while at the other end water and mud was encountered. The job requires the handling of:

1,400,000 cubic yards....Classified Excavation.
1.800,000 cubic yards....Borrow for Coldazell Fill.
50,000 cubic yards....Concrete.

The average cost per mile is $250,000.00.

The contractors used seven steam shovels, a large number of teams and three concrete mixing plants. In connection with the work one sand-dredging plant and two rock quarries are also in use.

The contractors have done all the work themselves, none of it being sublet.

The work was prosecuted under the general direction of Mr. R. O. Parsons, District Engineer Southern Railway, Toccoa, Ga., but under the direct supervision of Mr. B. L. Grenshaw, Assistant Engineer for the Southern Railway from Knoxville, Tenn. When this work is completed, as it will be about September 1, 1918, the contractors will have the distinction of having completed two of the most difficult contracts on the Southern Railway System. One is at New Glasgow, Virginia, covering a section of nine miles, which included a rock cut one mile long, maximum depth, 100 feet, in which was found practically all solid and very hard rock, where it was necessary to use a large quantity of Du Pont Company's highest grade Gelatin Dynamite, some of it being as high as 90%. The other contract is the one above referred to between Toccoa and Ayersville, Ga., which gives the contractors the further distinction of having successfully excavated the largest and most difficult cut on the Southern Railway, and of having made the highest and largest fill of such great depth, 169 feet, in the world. The concrete work for the viaduct 1,400 feet long and 200 feet high, which is built with hollow concrete piers, gives the Engineers of the Southern Railway Company the credit for having worked out the first hollow pier construction to be used for such a high bridge.

# Editorial

## The Threshold of Prosperity

The man who talks "calamity and trouble ahead" is looking through the wrong end of the telescope; he is blind to the world about him; he is totally ignorant of existing facts and conditions; he has not even begun to analyze the situation—take him in hand and show him the light.

Bounteous crops and good prices have put greater purchasing power into the hands of the agriculturist —the governor of prosperity. Building of all kinds, except for actual war needs, has been at a stand-still for more than a year; there has been no road-making; the purchasing of luxuries has had a sharp decline; farm machinery of all kinds, automobiles and innumerable other kinds of articles, implements and equipment have been under the ban during the crisis in order to divert mechanical and human energy to the quick and successful culmination of the war. Now that the war is over it is clear what is going to happen. Advertising campaigns of great magnitude will be launched in all lines of business; plants working on government requirements were enlarged to increase production—these plants must now turn to peace time products, they must be kept busy, and it is reasonable to conclude that they will be when we consider that their regular lines have been off the market for so long and the needs for them have piled up during the war period. Real estate operators, building contractors and material concerns are preparing for unprecedented activity; road making machinery plants will be taxed to meet the demands for their equipment; automobile factories will have to meet the accumulated demand for cars.

The thrift campaigns in connection with the Liberty Loans and War Saving Stamp Drives, have taught the people to save, and they have saved. The purchasing power of the indiidual has greatly increased; labor is being paid a higher wage—the living scale is on a higher plane than it has ever been in the past. This is an indication of better and bigger business for everybody. Associations of men are and have been gathering for consultation and planning for this reconstruction period, arranging best ways and means for quickly getting back to normal business and making up for lost time. Advertising will be an essential factor in their plans. One does not have to be a confirmed optimist to see that the future prosperity and busyness of the nation are assured.

## Convention of Building Industries

A convention of building industries has been called by the National Federation of Building Industries to meet at Hotel Traymore, Atlantic City, 9 a. m., on Friday and Saturday, December 6 and 7.

Any association of architects, contractors, engineers or manufacturers or distributors of building materials who have failed to receive formal notice are invited to send delegates with power to act for their respective associations in outlining a policy and program for action during the reconstruction period now at hand.

It is expected that a permanent organization will be formed and committees appointed to handle the various new and unusual problems that will present themselves in this time of readjustment.

## National Demand for Permanent Improvement of Highways Grows

With the ink scarcely dry upon the armistice which closed the greatest of all world wars, tangible evidence is already coming to light of one of the greatest forces for good resulting from our participation in the great struggle. Definite plans are now being made for the building of through, connecting permanent highways destined to be of value to the entire nation. The war brought home a national appreciation of our imperative need for permanent, through connecting highways. Transportation conditions existing in 1917 and 1918 focus attention upon this need.

With an eye to the future, the Lincoln Highway Association anticipated developments in this connection, and is prepared for a greater measure of active, constructive endeavor in 1919 than ever before. Despite its evident importance, road building was being more and more restricted as time passed, but with the cessation of hostilities, a more liberal policy on the part of the many agencies governing such constructive endeavors, is confidently to be expected; more, it is anticipated that every such agency will lend its full support to the immediate resumption of such work.

The State of Illinois provided for the complete hard-surfacing of the Lincoln Highway from Geneva to the Mississippi River, but war-time conditions prevented the undertaking of this work in 1918. The demand for this improvement has grown. At the November election, the voters of the State of Illinois approved a sixty million dollar bond issue by an overwhelming majority, for the construction of a state-wide system of permanent roads. The bonds were not to be sold, nor the work started until after the war. The end of the war came within a week of the approval of the bond issue. It is but fair to assume that the work of finishing the construction of the Lincoln Highway in the state will be undertaken at the first available opportunity in the spring.

The action in Illinois set a precedent. Information has just been solicited of the Lincoln Highway Association as to the ways and means of providing for the adoption of similar measures in the State of Nebraska. Within the week thirty-six letters have been received at the offices of the Lincoln Highway Association, in Detroit, from representatives of the National Organization, located in each of the eleven states crossed by the route, from coast to coast, advising of plans for the furtherance of actual construction, now that undivided attention may be given to such projects.

The war is over. The period of reconstruction has come. Highway improvement, along the lines advocated by the Lincoln Highway Association, seems destined to receive the first attention.

## What Limestone is Worth on the Soil

A ton of ground limestone is worth approximately $8, as determined by the crop increase which it will bring when applied to the average soil in Missouri. This figure has been secured by averaging the returns from lime on the various soil experiment fields of the University of Missouri College of Agriculture when crops are figured at present values. The cost of a ton of ground limestone

at the crusher varies from $1 to $1.50. The freight rate over a single road for 100 miles is 60 cents, and the cost of hauling two or three miles and spreading on the land is around $1.50 per ton. The total cost, therefore, of limestone spread on the land in most parts of Missouri will vary from $3 to $3.50 per ton. This means that liming will return 200 to 300 per cent. on the investment on lands which need it. M. F. Miller, of the College of Agriculture, suggests that Missouri farmers handling sour lands should consider liming as a war measure.

## Annual Convention of the American Road Builder's Association

At the invitation of Mayor Hylan, the Merchants' Association and other civic organizations, the American Road Builders' Association has decided to hold its sixteenth annual convention in New York City. This is the first time in the long history of the organization that an annual convention has been held in the city of New York, and every effort is being made to make the meeting an event in keeping with the municipality in which it is to be held.

After careful consideration of the facilities and the location of the meeting places available, the executive committee, in which the active direction of the association's activities is vested, has chosen the Hotel McAlpin. The convention will begin on Tuesday, February 25 and end on Friday, February 28. The program which is being prepared, will include technical sessions every forenoon and afternoon, a dinner on one evening, and exhibition by material and machinery dealers and manufacturers, and a number of entertainments. The exhibition will be held in the roof garden and will comprise displays of models, photographs, sample of materials, and the like.

The American Road Builders' Association, as its name implies, is a national organization of the men who are actively engaged in various capacities in the construction and maintenance of highways—both country roads and city streets. It includes in its membership almost all of the men prominent in this field, among whom are many of national and international reputation. Like other organizations of men who do things it has contributed a large proportion of its members to the nation's one big job, but enough remain at home in the all-important work of keeping the country's roads up to the top notch of efficiency to make its annual meeting the chief event in the road building field.

The American Road Builders' Association was organized in 1902, primarily to provide a common meeting ground for the men then in charge of road building in the few states that had established state highways departments. The good roads movement was then little more than in its infancy, but as the demand for better highways increased and state after state adopted the state aid principle in the improvement of its highways, the scope and influence of the association grew wider and its membership increased. Its first convention was held at Detroit, Mich., February, 1903, and has been followed by others at Hartford, Conn.; Port Huron, Mich.; Pittsburgh, Pa.; Columbus, Ohio; Indianapolis, Ind.; Rochester, N. Y.; Cincinnati, Ohio; Philadelphia, Pa.; Chicago, Ill.; Oakland, Cal.; Boston, Mass.; and St. Louis, Mo.

An innovation in the method of holding meetings of this kind was made at the Columbus convention in 1909 by the holding of an exhibition of road building machinery and materials. This feature proved so popular and so valuable that it was made permanent and there have been similar, but larger and more varied displays at all the subsequent conventions except the one at Oakland, which was held jointly with another organization at the time of the Panama-Pacific International Exposition, and the one at St. Louis, in 1918. The exhibition of heavy machinery was omitted for patriotic reasons this year, the officials feeling that despite the practical value of such display they were not justified in asking manufacturers and dealers to get together and ship the extensive displays they were in the habit of making. In place of the usual show there was a large and interesting exhibition composed chiefly of photographs, models, literature and the like. As already noted, the same plan is to be followed this year.

## Sand Men Discuss Ways to Meet Business

To determine how to meet the great reconstruction demands for their products, the American Sand Association, which represents seventy plants supplying the iron and steel trade of America with gray iron and steel molding sands, met recently in the William Penn Hotel, Pittsburgh. Most of the plants represented are in eastern Ohio and western Pennsylvania. H. C. Koontz, of the Superior Sand Company, of Cleveland, presided. It was said France alone will spend $5,000,000,000 in this country for reconstruction work.

The following were appointed to represent the association at the meeting of war service committees of all industries, to be held at Atlantic City, December 4, 5 and 6: Dr. A. P. Howland, of Cleveland; E. M. Ayers, of Zanesville; F. E. Gordon, of Conneaut; H. A. Keener, of Columbus; V. L. Whitehead, L. R. Farrell, M. MacEverhart, of Massillin; Mr. Koontz and H. B. Fuller and H. G. Leonard, the latter of Mansfield.

## Important Highway Conference to be Held in Chicago

Final arrangements are now being completed for the National Highway Convention to be held in Chicago the first week in December, under the auspices of the American Association of State Highway Officials and the Highway Industries Association. A notable attendance of highway authorities is assured.

Highway officials from practically every state in the union, as well as representatives of the various national highway organizations have expressed the intention of being present. Numbers of government officials have also accepted the invitation to attend. The honorable Frank Lowden, Governor of Illinois, will open the convention with an address of welcome. Nationally known authorities upon highway afiairs will speak, including Logan Waller Page, Chairman the United States Highways Council; Hon. James I. Blakeslee, Fourth Assistant Postmaster General; Hon. James M. Cox, Governor of Ohio; Roy D. Chapin, Chairman Highways Transport Committee, the Council of National Defense, and Vice-President the Lincoln Highway Association; A. G. Batchelder, Executive Secretary, the American Automobile Association, and Lieutenant-Colonel W. D. Uhler, United States Army.

Each phase of existing conditions pertaining to American Highways will be thoroughly discussed, and plans will be formulated for an energetic concentration of all possible forces looking to a systematized plan of actual construction upon a national basis.

Invitations have been extended to the officers of such widely known organizations as the Lincoln Highway Association, the Dixie Highway Association, the Jefferson Association, the Yellowstone Highway Association and others to be present.

## Statement by S. M. Williams, President, Highway Industries Association, Maryland Building, Washington D. C.

Owing to the great public importance of the conference scheduled at Atlantic City the first week in December between the War Service Committees which were organized during the war by the Chamber of Commerce of the United States at the request of the War Industries Board of the Government it became necessary to postpone the Highway Congress originally called to meet in Chicago during that week under the auspices of the American Association of State Highway officials and the Highway Industries Association. The Highway Congress will therefore meet in Chicago the week following the Atlantic City meeting, namely, December 9th, 10th, 11th, 12th and 13th, in the Congress Hotel and Annex, Michigan Boulevard at Congress Street, Chicago. S. M. Williams, President of the Highway Industries Association, has made public in Washington the following statement concerning the need for this postponement and the facts surrounding the situation:

"The meeting of the War Service Committees at Atlantic City," Mr. Williams said, "was originally to have taken place during the middle of November, and it was postponed because of the influenza epidemics until the first week in December, a date unexpected by the general business public. Owing to the importance of the War Service Committees meeting, and the very great desirability that many of those interested in Highway problems should attend the Atlantic City conference, the postponement of the Highway Congress was decided upon. It was realized that while the War Service Committees were primarily formed for the consideration of business matters from a war point of view, it was taken into consideration that these committees will have a great influence upon the reconstruction of business after the war. One of the most important subjects for the War Service Committees to consider is that of a definite and aggressive policy for highway development to meet the economic necessities of the country from both the National and State control point of view. It was therefore deemed wise to give the War Service Committees, which will now prove to be Reconstruction Committees, an opportunity to deal with highway problems in the big conference on business which will take place at Atlantic City before the meeting of the Highway Congress."

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## Test Concrete Boat Opens New Era in Navigation

### The Faith Weathers Storm as Steadily as an Island, Says Skipper

Fifty years ago a great crowd gathered on the banks of the Clyde to see a ship launched that they thought would prove ancient prejudice right and forward looking progress wrong. It was the first iron vessels ever built. "Iron," quoth the populace, "never had floated, and iron never would float." The logic seemed unshakable to them. The ship lazied down the waves, and just as everybody was framing the words "I told you so," she rose upon the launching wave and rode as buoyantly as a wooden vessel. A new maritime era had dawned.

Six months ago another great crowd stood in a meadow near San Francisco that ran right down to the water, and watched another experiment in shipbuilding. A new material was striving for recognition —reinforced concrete. A stone ship, in other words, one that had been mixed in machines and poured into moulds, with twisted pieces of iron for strength.

### Experiments That Pointed Wey

This crowd didn't say it was impossible—the world has seen too many impossible things come true and has grown wondrous wise, in that it keeps its opinion to itself. But the people were plainly skeptical. True, a rowboat had been built of reinforced concrete in 1849 —at Carces, France, and still survives. Numberless barges had since been built of the same material and have showed remarkable strength under the heaviest usage—especially those on the Welland canal, where carloads of stone blocks are dropped upon their decks from a 12-foot trestle; Italians on the river Piave had mounted some of their heaviest guns on concrete barges and used these floating batteries against the Austrians; in Norway there is even a reinforced concrete dry dock, and the same country had likewise produced a 200-ton ocean going vessel that made the trip to England.

But this boat in the California meadow—appropriately named the Faith, because faith can move mountains—was so much larger than anything that had yet been attempted in that line, that the people were frankly skeptical. How could a concrete vessel of 5,000 tons, be 326 feet long and 44.6 feet wide, be built strong enough—and float—to withstand the terrific strains of the sea? Would not the pressure force the water through the sides like a sieve? Would not a heavy sea overwhelm her?

### Scoff at Ungainly Shape

And the people scoffed at the ungainly shape of her, for a watering trough is artistic by comparison. She has a prow that is a maritime nightmare, and a stern that has no name in marine architecture. Her sides look like a curbstone.

Launched sideways, the Faith rolled until the water was within a foot of her top. The lips of the wiseacres framed the words, "I told you so." Then she slowly righted herself and floated buoyantly; two tugs that had retired to a safe place, came racing up, made fast and towed the conquering "Faith" to where her machinery was to be installed.

But how would she behave in a sea? At first it was decided to load her with coal and tow her to some coast point. But the confidence of the builders hardened daily with the concrete—and they decided to send her out under her own power.

All the preliminary tests were complied with; her 2,600 horsepower engine had driven her three knots faster than the prescribed eight, and she had been declared seaworthy, as far as they could judge, by the government inspectors.

Then the owners loaded her with the heaviest cargo they could get, salt and copper ore—and sent her to sea. Capt. R. E. Connell was on the bridge and his chief officer was N. L. Matheson. They had a crew that had almost fought for the trip, daring, capable fellows everyone, who believed in the new, if unsightly, development.

### Bring Boat to New Orleans

This same Capt. Connell and N. L. Matheson came sailing their stone boat up the Mississippi not long ago, and told The Item of that memorable voyage.

"We left San Francisco May 22, 1917" they said, "and poked our nose into a gale almost as soon as we left the Golden Gate. There were heavy seas and a wind you could lean against. The waves went over the wheel house, and she shipped heavy seas forward and aft. That is the hardest test a ship could be put to.

"It was a 90-mile gale. After two days we ran for shelter—not that we were afraid for the ship, for she was as safe as an island, but because there wasn't any use wasting the fuel trying to sail in the teeth of this storm.

"As we came about and lay in the trough, she rolled only 13 degrees, which was remarkable!

### Ship Rides Through Storm

"Well, we laid behind an island 14 hours, and then went out. But before we got to Seattle, we ran into heavier weather still. We faced the music, however, and we never saw a ship put to a severer test.

"We had the bilges sounded every hour, but not a drop of water came in."

A wooden ship when it is new will leak 3 or 4 inches in an hour; a steel one about half as much.

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## Saving Cement Sacks

The demand for cotton products has created an unprecedented shortage. There is also a decrease in cotton acreage, which makes the situation still more critical. Cement sacks must be saved. Empty sacks should be returned at once.

Supply dealers are being urged to warn their customers that a sack that has been wet is useless, and the sacks should be stored where they will not be injured by water. The sack should also be protected against injury in handling. It is becoming a question of saving sacks or having no sacks to save.

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## Slag for Road Construction

Blast-furnace slag for a number of years past has been used in the country districts and manufacturing towns of England for the construction of roads and as a macadamizing agent. If properly selected, it forms a very good foundation, but should be placed at an incline in such a manner as to hold each lump upon its adjacent lumps, to prevent rocking, and then should be covered over with fine blast slag and properly rolled and consolidated afterwards.

It is also successfully used with tar and other bituminous materials for footway and sidewalk paving.

### As a Concrete Aggregate

As a concrete aggregate it is a very good material, if clean, but it takes almost double the quantity of cement required than when working with river gravel as an aggregate.

Owing to its very absorbent nature it requires much greater care in mixing, and for this reason some engineers will not use it if other aggregates are available, nor is it considered economical to use it unless it can be found at or near the spot and can be delivered at the mixing floors or machines at very low charges for transportation. It is principally used in this connection for the floors of warehouses.

When once set, concrete made from blast-furnace slag is very tenacious and it is almost impossible to break it up with pick or bar.

## Orders for Giant Griffin Mills and Bradley Hercules Mills

The Ho Hong Portland Cement Co. located at Singapore, Federated Malay States, the manager and engineer being an American, Mr. J. C. Muir, has purchased an entire plant in the United States, shipping Giant Griffin Mills for the pulverizing of their raw materials, clinker and coal, making it an entire Giant Griffin Mill plant. The materials used in the manufacturing of their cement is coral, which is found in great quantities within a short distance of Singapore. This company eventually will have a 1500 barrel plant, but at present will only operate a first unit of 600 barrels per day. American machinery is being used entirely.

The Cuban Portland Cement Co., Mariel, Cuba, have purchased two Bradley Hercules Mills as preliminary grinders on raw material and clinker. The International Portland Cement Co., Argentine, S. A., have also purchased two Bradley Hercules Mills, one to be used on the raw and the other on the clinker. Two of these Bradley Hercules Mills are now being shipped to the Dewey Portland Cement Co., Dewey, Okla., one to be used on the raw end and the other on the clinker.

The Lehigh Portland Cement Company, Allentown, Pa., have bought several Giant Griffin Mills. The Deschambault Quarry Corporation, Portneuf, Quebec, have purchased Giant Griffin Mills for the purpose of grinding limestone for agricultural limestone purposes and for the producing of asphalt filler.

In addition to this the Bradley Pulverizer Company, of Allentown, Pa., has made shipments of various mills to agricultural limestone producers and fertilizer plants for the purpose of grinding phosphate rock and other refractory material. At this time we might call the attention of our readers to the great number of Bradley Hercules Mills that are now in use in the United States. This mill was put on the market a few years ago and met with the immediate approval of the larger cement manufacturing plants. It is primarily a preliminary machine, used for grinding limestone or cement clinker, producing an exceptionally nice feed for the tube mill. Under ordinary conditions it grinds to a fineness of 55% to 60% through a 100-mesh, consequently increasing the output of the tube mill making the combination unit extremely economical. The Lawrence Portland Cement Company, Siegfried, Pa., now has four of these mills in operation. The Lehigh Portland Cement Company has three of them in operation at their Oglesby, Ill., plant and one at their Ormrod, Pa., plant. The Riverside Portland Cement Co., Riverside, Cal., has three in operation. The Superior Portland Cement Company, Concrete, Wash., has two in operation. At this plant one of the mills is used for grinding wet raw material. The other mills are used for grinding cement clinker.

Another use of this mill is the pulverizing of agricultural limestone. It is an extremely large pulverizing unit and takes material 2-in. and under for feed and reduces it to a fineness of 60% through a 100-mesh in single operation. The manufacturers declare that it is the most economical grinding unit ever offered to cement manufacturers. Its operation is very simple and its efficiency very great. There are twenty-two of these mills in operation in various sections of the country, all of which are reporting wonderful results. It is a mill that will rank with the well-known Giant Griffin Mill as being a very popular grinder of cement materials.

# "Aberthaw" Boats of Reinforced Concrete

A recent development of the Aberthaw Construction Company, of Boston, is the construction of concrete vessels at their newly established shipbuilding plant at Fields Point, near Providence, R. I., where they are now building 500-ton lighters with plans under way for boats of other and larger types. The system employed at the Aberthaw yard differs in some respects from what has hitherto been the practice, and is the result of the experience gained in twenty-five years of reinforced concrete construction.

In "Aberthaw" practice only an extremely high grade Portland cement ground so that 90 per cent will pass a No. 200 sieve is used while the aggregate is of such a size that it will pass a ⅝-in. ring. The sand is either broken or clean bank gravel well washed and graded ranging in size from ⅛ to ½ in. Care is taken in the selection and grading of the aggregates, the maintenance of a rich mixture, the avoiding of an excess of water and, perhaps what is of the most importance, all batches are mixed for not less than two minutes after all the material is in the mixer. In mixing, the stone and a portion of the water is placed in the mixer first which is turned over sufficiently to scour the sand clean; the remainder of the aggregate, cement and water then being added. In order to obtain best results it has been found that the amount of water required is 9 per cent by weight of the cement and aggregates.

Concreting proceeds continuously from the point at which it starts working constantly around the edges of material already deposited so that in no case does any section of concrete stand, whether in the wall of floor, for more than one-half hour before continuing to concrete. When a definite joint is provided the surface is carefully picked to remove all laitance, washed thoroughly clean and painted with a coat of grout made of neat cement and water mixed to the consistency of cream. Care is taken that the concrete proceeds before the grout gets its initial set.

The "Aberthaw" system requires the forms to be made up in panels, every precaution being taken to insure a smooth, true, impervious surface on the outside, the exact dimensions given being rigidly adhered to as the small sections and high stresses used might be productive of serious results in the event of any division from the required concrete sizes. The panels are surfaced with a covering of 26-inch galvanized iron, the metal sheets being butt-pointed and tacked in position with the metal stopping exactly at the edges of the panel. Both inside an doutside panels or forms are made of sound air-dried lumber with extra cleating to prevent warping and twisting and to provide a smooth, tight surface. The surface of all exposed woodwork is painted with one coat of boiled linseed oil as soon as the panels are made up in order to make them as impervious to weather conditions as possible.

Throughout the erection of the forms a variation from level of more than ¼-in. is not allowed.

Aberthaw Shipyard at Fields Point, R. I.

In the Aberthaw specifications the outside shell and deck are 3 in. thick and are reinforced with round deformed bars of the Corrugated or Havemeyer type, all of the reinforcing steel being of mild structural grade, the longitudinal girders being in one continuous length, butt-welded where necessary, care being taken that the welds are staggered, so that no two welds are within 40 in. of each other, while the bars for the transverse frames are made continuous in like manner. All intersections of bars are fastened with soft annealed wire wrapped around them and tightly twisted. No steel is placed nearer to the surface than one inch. Each barge requires 500 barrels of cement, 75 cubic yards of sand and 130 cubic yards of ½-in. stone, together with approximately 44 tons of reinforcing rods ranging in size from ⅜-in. to 1⅛-in.

The lighters which are now building at the Aberthaw yard are 112 ft. over all, with 34-ft. beam and 11 ft. 6 in. depth and of 500-ton capacity. The draft empty is 3 ft. 9 in. and fully loaded 9 ft.

The general shape of the barges is that of a rectangular box with the bottom sloping upward at each end and

the corner formed by the junction of the sides and bottom rounded off to a 6-in. radius. Four transverse and two longitudinal bulkheads divide the lighter into fifteen watertight compartments of approximately equal cubical capacity. The bottom slab and frame are designed to carry an upward pressure of water equal to a head of 11 ft. 6 in. and the side walls and frames are designed on the assumption that the watertight be flush with the deck. The sides and the bottom are painted on the outside for greater impermeability, the bottom on the inside being flowed level with a rich mixture.

The decks of the lighter, which are granolithic finished, are without camber and designed for carrying coal or a similar cargo; being constructed to take a uniformly

Interior View of Concrete Barge

distributed live load of 500 lb. per square foot, while the compartments themselves are well adapted for handling fuel oil. Each of the fifteen compartments is fitted with a hatch set in an iron frame furnished with rubber gasket and suitable provision for battening down. To assist in holding the deck load a timber bulkhead is built enclosing an area 90 ft. by 30 ft. The side bulkheads are 2 ft. high and end walls 5 ft. in height.

The barges are fitted with cast iron chocks, cleats and bollards; the majority of the balance of the hardware used being galvanized. Bitts and fenders are of oak, the remainder of the woodwork being hard or longleaf yellow pine, dressed on four sides. On the sides of the lighters and at either end is the "Aberthaw A" in brass, a mark that represents 25 years' experience in concrete construction.

## New Catalog of Kent Continuous Mixers

The Kent Machine Company, Kent, Ohio, new Catalog No. 9, 6 by 9 in., contains 40 pages of pictures of and descriptive matter pertaining to Kent continuous concrete mixers. These machines are finding widening use principally because of the satisfaction given. They are continuous, automatic-measuring, in which the entire process-measuring, dry mixing, wet mixing and discharging is automatic. Hand labor is done away with except what is necessary to get the materials into the hoppers. These hoppers are of special design, the sand feeding device, for instance, being so arranged that wet sand runs with precise regularity. This is accomplished by a simple flat plate so large that practically all the sand in the hopper is directly supported by it, instead of by the hopper walls, and extends forward beneath the throat projection. In operation the hopper remains stationary, but the feed plate has a reciprocating movement carrying with it a layer of material equal to the thickness of the discharge opening, the material in the hopper following down by gravity. This feeding method is described in detail in the catalog and diagrams are shown explaining it clearly. The single-shaft, "pug-mill" type of mixing apparatus, with blades bolted to a square mixing shaft, is used. The mixing paddles are narrow and numerous, so that they chop, stir, turn and thus mix the materials both before and after the water is added. Sand and cement drop in the same place in the trough, so that the dry mixing begins immediately. More than half of the entire length of the trough is used for the dry mixing. The water supply is under the control of the operator, each spray having separate regulating valve. There is also a shut-off cock on the supply pipe so that the water may be shut off without disturbing the adjustment for the sprays. Several types of mixers are manufactured for construction and road work of all kinds.

## Modern Shipbuilding Terms

**Defined and Illustrated by F. Forrest Pease. 72 Illustrations. $2.00 net. J. B. Lippincott Company, Publishers.**

We are embarked upon one of the greatest undertakings this nation has ever financed—the building up of a fleet capable of feeding the nations of the world, and supplying men and munitions to the European battlefields on a war-winning scale. To do this, the shipbuilding industry has been enlarged enormously with labor drawn from all classes—men who, a few months ago, knew little and cared less about the skilled industry in which they are now important units. That industry has a language of its own; and in order to become fully effective, the labor of its army of workmen must be able to follow orders in that language, intelligently and promptly. In **"Modern Shipbuilding Terms, Defined and Illustrated,"** soon to be published by the J. B. Lippincott Company, the entire vocabulary of shipbuilding terms is given, defined and illustrated by F. Forrest Pease, an instructor in the Emergency Fleet Corporation Training Department. Those workmen who have learned their trade in foreign shipyards, will find this as useful as their untrained fellows. The book is almost an encyclopaedia of the industry, for the use of its tools is clearly given, and a splendid series of illustrations showing the progressive steps of ship construction, together with a section on electric welding. An appendix gives the most important subjects additional treatment, and it will be found an invaluable aid to speeding up of production, if all workers keep a copy of this handy little book where they can refer to it at need. Costly errors will be avoided, and the splendid patriotic work we all have so keenly at heart—that of keeping "Black Jack" Pershing's "Bridge of Ships" moving between America and our boys in France—will be given a big boost. The country is as proud of the great record the shipworkers are making as they are of the pluck and mettle of the boys in uniform—and that's saying a great deal! Make use of this practical tool to increase your efficiency.

# The Trade Acceptance*

**By Albert Moyer**
Manager of Sales, Vulcanite Portland Cement Company

The trade acceptance is defined by the Federal Reserve Board as a draft or bill of exchange, drawn by the seller on the purchaser. These trade acceptances must have a maturity of ninety days exclusive of the days of grace, except that, if drawn for agricultural purposes or against the sale of live stock, it may have a maturity at time of discount of not more than six months exclusive of the days of grace. Trade acceptances should have nothing to do with nor be employed in any class of transaction except that concerning the purchase and sale of goods and should represent only current transactions.

Please observe that a trade acceptance is not a sight draft or a promissory note. As one authority has explained, a note is drawn by a person, whereas a trade acceptance is drawn on a person. A note is generally used in borrowing and in the settlement of past due obligations, while a trade acceptance bears on its face evidence that it is drawn by the seller of merchandise on the purchaser for the purchase price of goods sold. When accepted, it constitutes a valid promise to pay on a specified date, and as a negotiable instrument it is as binding upon the acceptor as his promissory note, but it performs a different function.

We have all along been familiar with the complaint of the retail merchant that he is compelled to sell on credit and that the thirty days or other term of credit which he grants is usually strung out to ninety days or a longer period; that this carelessness about paying up leads to collection costs, litigation and bad debts, to say nothing of the interest on the money tied up and the inability to use such money in expanding business. The substitution of trade acceptances or liquid commercial paper for open book accounts helps the credit position of the country materially by increasing the credit to that extent. The trade acceptance system would practically eliminate overdue accounts, which, according to records obtained from jobbers and dealers, amount to about 30 per cent of the sales, and if legal proceedings are necessary a trade acceptance is much better than an open book account, because the seller has acknowledgment in writing of the correctness of the account.

All of the conveniences of the open book account can be retained; for instance, the right to make partial payments, which can be arranged for with the bank. If the customer is not able to meet the trade acceptance when it comes due, and if the dealer wishes to help him out, he can do so by having the customer sign a promissory note with interest, and in this manner the purchaser grants his customer the favor of an extension, but without the loss of interest that accrues under the old system. Trade acceptances are never good for renewal of an old account. These should always be settled with notes drawing interest.

Open book accounts cause the dealers to act as bankers in supplying credit to their customers. This fact is seldom realized by the dealer in making price for goods to be sold to the trade. The use of trade acceptances passes the banking business of the dealers over to the bankers, where it belongs. The use of trade acceptances makes it unnecessary for the dealer to borrow money.

If you will study this subject, you will undoubtedly realize that all this trouble can be largely abolished by the adoption of this method of collection. This system would curtail or end the taking of unearned or unauthorized discounts, would curb the unfair practice of returning merchandise after shipment of delivery has been made, would tend to stop the pernicious practice of assigning or hypothecating open book accounts to secure working capital, and would operate to reduce the overhead cost of doing business.

There have been some objections raised as to the adoption of the trade acceptance as a means of collecting for goods purchased. One of the objections raised is, where purchases are made daily or frequently in small amounts the number of trade acceptances would necessarily be very great. The answer to this is, that it is assumed that where purchases are made several times weekly in small amounts, they will be combined into one semi-monthly or monthly statement, which will be settled by giving one trade acceptance semi-monthly or monthly.

Another objection to the trade acceptance is that the trade looks on it as a demand note. When asked to give a trade acceptance, the customer often answers that he has never given a note in his life and he doesn't intend to. If you will inform your customers, both verbally and by letter, explaining what a trade acceptance really is, how it will be of benefit to the country and of benefit to your customers in increasing their credit in the community, they will soon understand that this is not a note they are giving, and as far as affecting their credit adversely is concerned, the trade acceptance is the reverse of a demand note. Mercantile agencies usually base their estimate of a man's worth and character upon the manner in which he meets his own financial obligations. The trade acceptance is self-evidence of prompt payment. Those who settle by this method put themselves in the class of preferred buyers, the same as those who discount for cash. This fact is recognized by the commercial agencies in their ratings, and the inevitable result will be that those who demand long credit only on the basis of open book accounts will have to pay higher prices than those who discount or use trade acceptances. Those who pay bills promptly, taking the cash discount premium, are not expected to use trade acceptances. A trade acceptance is merely to take the place of the open book account.

The method of procedure in putting this system to practical use is as follows: Your customer buys a bill of goods, and if he cannot pay cash you request him to sign a trade acceptance, which may run for ninety days, or if for agricultural purposes, it will run for six months. You sign this paper also, take it to the bank and get cash for it, subject to the prevailing rate of discount, which rate of discount is one-half of one per cent lower than for a promissory note, due to the fact that the bank can take this paper and rediscount it at a lower rate of interest in a Federal Reserve bank. Your customer now has the goods, your banker has the trade acceptance, and you have your money. You have not more trouble with the transaction unless your customer fails to pay the trade acceptance at the specified time. The banker is the one that makes the collection. If your customer fails to pay, you are in less trouble than if you had an open book account, for you have a positive acknowledgment of not only the receipt of the goods but the accuracy of the account and you can sue with little or no trouble; but your customer does not want to have his credit bad at the bank or in the community. He therefore will pay his trade acceptance promptly.

This system gives the merchant increased working capital; the conversion of open book accounts into cash releases immediately the capital you have tied up in your books, which brought you no interest whatever. You can therefore either operate with less capital or do an increased business on the same capital. This means greater profits. If you operate with less capital you then have money available to invest in Liberty bonds, and in this respect trade acceptances will perform patriotic service.

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*Address delivered before convention of Long Island Coal & Building Material Dealers Association.

We assume that your customer does not want to accept this paper, but will reject it. You should keep a list of these acceptances as they go out, number them and record the amount of each and the name of the customer. If an acceptance does not come back within a reasonable length of time, say ten days, write the customer a letter, saying that you mailed the acceptance on such a day, and ask him to return it. If you do not get an answer, write him again. If you follow these proceedings every 10 or 15 days, the matter remains in your collection file, and is kept before you. None of your time is lost. You can go after it from a collection standpoint as well as educate your customer in his use of trade acceptances.

When you make up your invoices and statements every 10 days, semi-monthly or monthly, as the case may be, attach to each invoice a trade acceptance properly filled out. Send your customer a letter calling his attention to the desire of the Treasury Department and the Federal Reserve Board to have the credit position of America in the most liquid possible shape as a basis for the successful financing of the war, and calling particular attention to the desirability of having this credit instrument called a trade acceptance take the place of the old-fashioned open book account. Advise him that the mercantile agencies give better credit ratings to those using trade acceptances, that the banks are heartily in favor of their use and urge their customers to use them; also by signing a trade acceptance he is relieving unnecessary strain on the country's financial resources. If, however, he wishes to take advantage of the cash discount you offer, he can send a check in payment of the account promptly. Also inform him that in accepting the trade acceptance, he is receiving an extension of credit without causing any loss to the bank or to you as a merchant, as the bank can rediscount this trade acceptance in the Federal Reserve bank. Inform him that the trade acceptance is evidence of prompt payment and is not looked on by the bank, mercantile agencies or others the same as a promissory note, they being absolutely the reverse of a promissory note as far as affecting credit is concerned. With this letter enclose an educational pamphlet describing the use of trade acceptances. These pamphlets can be obtained by applying to the American Trade Acceptance Council, 5 Nassau St., New York.

In accepting a trade acceptance, your customer must designate either payment at his own office or at his bank.

With Liberty Loan drives, Red Cross drives, and other desirable and necessary campaigns, and the payment of the income tax and excess profit tax, there will be an enormous strain upon the banks of the country. We may expect credit to be curtailed, and if curtailed a line will certainly be drawn to differentiate strictly commercial from credit of an obscure character. The trade acceptance is a form of credit which should be subject to the least discrimination, so that its importance as well as advantage is obvious. Capital requirements are already straining the credit capacity of banks and manufacturers. There is no resort but the Federal Reserve System, no method of using its resources left but the trade acceptance. In an ever-tightening money market and ever-growing capital needs for money, the trade acceptance should be the universal system for all. Efficient business methods make it necessary and at the same time patriotism demands it.

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## Agricultural Lime Bureau

At the request of the Department of Agriculture, the Lime Association, 503 Riggs Bldg., Washington, D. C., has arranged for the inspection of several lime plants by Dr. C. C. Fletcher, in charge of the lime work at the department, who desires further to familiarize himself with the different methods of lime manufacturing, hydrating, packing and shipping for agricultural purposes, writes Robert F. Hall, General Manager, Lime Association.

Through the courtesy of the following producers, arrangements have been made for Dr. Fletcher to inspect all of the prevailing methods of lime production, etc. His trip will include calls at the plants of the Knickerbocker Lime Company, Knickerbocker, Pa., the Charles Warner Company, Cedar Hollow, Pa., the Merion Lime & Stone Company, Norristown, Pa., the Palmer Lime and Cement Company, York, Pa., and the Steacy & Wilton Company, Wrightsville and Bittinger, Pa. Later Dr. Fletcher intends to visit the other producing districts of the country engaged in the manufacture of agricultural lime.

Dr. Fletcher's cooperation is of great commercial importance to a better understanding by the Department of the desire of our companies to supply the farmer with a product equally as high grade as that devoted to the building and chemical trades. The Association is also concentrating earnestly to establish in the minds of farmers the direct principle involved in the use of lime for soil improvement, which is not clearly understood by the average farmer. In this connection, our investigational work shows that farmers as yet fail to understand the relative neutralizing power as contained in the oxide and carbonate forms of liming material, and it will be the work of the Association to have the Department of Agriculture, in the conduct of its liming project, clearly define to the farmer in its various publications, what neutralizing power means, and that in the purchase of a high grade lime the farmer is buying twice to three times the neutralizing power in the form of burned lime, that he does in the same amount of ground or pulverized limestone.

Among other subjects pertaining to agricultural lime that the representatives of the foregoing plants to be visited have been requested by the Association to discuss with Dr. Fletcher, are: (a) the economy in the purchase by the farmer of a high grade lime product. as compared with the numerous grades and degrees of fineness of carbonate materials now on the market; (b) the nature and extent of the operation involved in the manufacture of a high grade liming material, in that the best that can be produced is furnished the farmer; (c) that the interests of the farmer are looked after by the average lime company with the same degree of devotion, as those of the building and chemical trades; (d) the impracticability of storing large amounts of lime at the lime plant to meet the heavy demands prevailing during the two liming periods, and that it is of the utmost importance that the Department cooperate in every way possible, in the effort of the Association to develop a more even distribution of demand for agricultural purposes to relieve this strain on the industry; (e) under the prevailing condition of farm labor supply, the practice of winter liming can be engaged in for the relief both of the labor situation and of lime manufacturers in supplying promptly the requirements of farmers during the spring and fall liming periods. The effort already started by the Association for developing the practice of winter liming, will be pointed out in the hope that further progress by the Department along these lines can be made; (f) the business policy of practically all lime manufacturers of producing only a finely pulverized limestone of a mechanical analysis of 100% through a 60 mesh screen or finer.

# Approximately 225,000 Tons of Stone Were Thrown Down by This Notable "Shot"

The large and successful blast recently made at the Steelton, Pa., quarry of the Bethlehem Mines Corporation consisted of seventy-nine (79) 6″ diameter blast drill holes averaging 96.8 ft. in depth, the shallowest of which was 64 ft. and the deepest 120 feet. The holes were drilled by means of three (3) Sanderson-Cyclone Electric Traction Blast Hole Drilling Machines, and were operated by one (1) man to each machine and a master driller who had entire charge of drilling. The drilling time extended over a period of four months with the average working time per machine of 260 hours per month. Total feet drilled 7,648.

At 2:00 A. M. on the day of the blast, we commenced pumping the holes by means of two (2) gasoline driven outfits of our own design and make. At seven o'clock four (4) 2-men gangs commenced loading and by twelve o'clock noon they had sixty-nine (69) of the seventy-nine (79) holes completely finished. In addition to the above mentioned loading crews, we had four (4) men slitting the 5″x10″ cartridges in order to expedite the loading, and also six (6) men tamping the holes with "dust" taken from our Crushing Plant. This material is finely graded and consequently "free running" and our experience has led us to believe that it is as desirable a material—that can be used for "stemming" holes. The Du Pont Powder Company's products were used, an average of six (6) boxes of 50% in the bottom of each hole and an average of nine (9) boxes of 40% to each hole. Into all the holes of this blast, we loaded a total of 23,600 lbs. of 50% powder and 35,250 lbs. of 40% powder.

No. 6 Cotton Countered Cordeau-Bickford detonating fuse was used in each hole and No. 6 Plain for the "lead." Seventy-seven hundred (7700) ft. of the first mentioned fuse was used and fourteen (1400) ft. of the plain. At 2:30 P. M. the blast was completely loaded and ready to be thrown down, which we feel was excellent loading when the number of men employed and the weather conditions were all taken into consideration, writes C. Muth, Superintendent.

Technical Experts of the Du Pont Powder Company directed the loading and Mr. M. L. Jacobs, Genl. Supt. of all quarries of the Bethlehem Mines Corporation, was one of the visitors that observed the "shot."

Two (2) rows of holes were drilled, the first of which was 25 ft. back from the face of the quarry and the holes 19 ft. part on centers. The second row was 14 ft. behind this and staggered between the holes of the first row. Approximately 225,000 tons were thrown down by this "shot," which resolves itself into about 3.8 ton per pound of powder and 29 ton per ft. of hole drilled.

**A Blast that Produced Enough Crushed Stone for Six Months**

## Limestone Quarry

Additional machinery installed at the quarries of the Bessemer Limestone Company, at Hillsville, Pa., involving an expenditure of about $40,000, is now in operation. The improved facilities include washing apparatus, which will also sort the limestone. The improvements will enable the company to increase its output of both stone and agricultural limestone. The new machinery sorts out the smaller sized stone, which is separated and may be used for road building purposes and the like. At present the Bessemer Limestone Company is producing stone of all kinds at the rate of about 70,000 tons a month, and employs 250 men. Its production is steadily increasing and it is estimated the output this year will approximate 650,000 tons. Business in the agricultural limestone department has more than doubled in the past year. The greatest output of stone of all kinds by the Bessemer company in any one year was 600,000 tons.

# Rock Quarrying for Cement Manufacture

"Rock Quarrying for Cement Manufacture," by Oliver Bowles, is the title of Bulletin 160, just issued by the Bureau of Mines, Department of the Interior.

Charles L. Parsons, chief of the division of mineral technology of the bureau, in the preface of this bulletin, says: "The Portland cement industry has attained such magnitude in the United States during recent years that a report covering the quarrying of the raw materials of cement will, it is believed, be of value to the industry. The enormous increase in the use of concrete for buildings, roads, bridges, dams, retaining walls, and many other purposes has resulted in a vast production of cement. About the years 1907 and 1908 such heavy demands were made upon quarries producing the raw materials that the introduction of large and powerful quarry equipment became imperative. Since then the wide use of such equipment has revolutionized quarry methods. Consequently this is an opportune time to investigate efficiency and safety under modern conditions of operation.

"Recent rapid advances in the construction of concrete ships undoubtedly gives added impetus to the cement industry, and tends to increase further the demand for greater efficiency in quarry operation.

"Mr. Bowles personally visited sixty-four of the largest cement plants in the United States, from Oklahoma eastward. The results of his investigations comprise the major part of this bulletin.

"In the Bureau of Mines bulletins dealing with the quarrying of marble and sandstone, the necessity for careful blasting is strongly emphasized, as the production of sound blocks is desired. In quarrying rock for cement manufacture, however, the rock must be broken into fragments that can be easily handled, hence it is important to obtain a maximum of fracturing with a minimum of explosive. Effective blasting is, therefore, one of the most important subjects dealt with in this publication. It involves the diameter, distribution, and depth of drill holes, size and nature of the charge, method of firing, quarry conditions that influence blasting methods, and various other factors. Mr. Bowles presents many examples of actual blasting results and their controlling conditions.

"During recent years high wages and the scarcity of labor with a greatly increased demand for cement have resulted in important modifications in general quarry methods. The modern tendency is to use labor-saving machinery and methods wherever possible. As a result the method of drilling small holes close together, shooting down the rock in successive benches, and loading by hand has in most quarries given way to steam-shovel loading of rock thrown down in great quantities by large blasts in churn-drill holes.

"Certain operators who still retain tripod-drilling and hand-drilling methods claim that changing to churn drills and steam shovels would require too great an outlay of capital. The facts brought to light in this investigation indicate that as a general proposition, if the necessary capital is available, it is more economical to scrap the old equipment and purchase modern machinery than to attempt by antiquated methods to compete with modern plants.

"Other cement-plant operators having quarries of variable rock claim that the maintenance of a proper mixture requires tripod drilling on low benches and selective hand loading of the rock. By considering every phase of this problem Mr. Bowles makes it clear that in most instances this claim is invalid. Through the application of methods now in successful operation, or a combination of these methods, a uniform mixture may be maintained and the most modern quarry methods be employed.

"Methods of transportation within quarries, and from quarries to crushing plants, are discussed in detail, and many improvements are suggested. The chief features reflecting inefficiency are: Needless complication of trackage, especially in quarries with multiple benches; haulage on excessively heavy grades; the combination of too many different systems of transportation in a single quarry; and excessive rehandling of rock.

"No attempt is made to discuss problems connected with manufacturing processes except insofar as they are related to quarry methods. The method of mixing the raw materials in order to obtain the proper proportions of the constituents used has, in many instances, a marked effect on the quarry method, and consequently this particular phase of cement manufacture is discussed at considerable length.

"Many cost figures, obtained through the kindness of quarry operators, are given, with the principal controlling conditions, to aid quarrymen in judging the efficiency of the methods they use as compared with results obtained by others.

"In the type of quarries considered in this publication, quarrymen are subject to many dangers. The discussion of safety problems is not confined to one separate chapter, but whenever machines or methods are discussed the dangers involved are considered and the best means of minimizing such dangers are pointed out."

Copies of this bulletin may be obtained free of charge by addressing the Director of the Bureau of Mines.

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# Modern Electrically Equipped Quarry

The ready market for crushed, classified stone, suitable for concrete construction and highway work, has stimulated the Lehigh Stone Company, of Kankakee, Ill., to open and equip in modern fashion a new quarry seven miles west of that city. The quarry, and crushing and screening plant have been in operation about three months.

This plant is electrically operated throughout, energy for which is supplied to the motors at 440 volts, three phase, 60 cycles, by the Public Service Company of Northern Illinois, which extended a transmission line from Kankakee to the quarry and erected an outdoor transformer. The motors are all Allis-Chalmers make, slipring type with drum control, each being belt-connected either to the machine it operates, or to a line shaft for group drive. W. R. Crawford, of Allis-Chalmers Manufacturing Company, who sold the motors, supervised their installation. These motors aggregate a connected load of nearly 800 horsepower.

The large crusher and bucket elevator served by it are operated by a 200-horsepower motor; and the secondary crushers are driven by two 100-horsepower motors, the 76-foot elevator and the rotary screens being operated by one of 75-horsepower. Conveyors, smaller screens and pumps are operated by motors of smaller sizes.

The material quarried here consists of clear, hard, white dolomite, existing in nearly horizontal strata from 6 to 8 inches thick, not accompanied by clay seams. It comes within about 2 feet of the surface, requiring no expensive stripping. The deposit, covering a considerable area, has been tested to a depth of 100 feet by diamond-core drills, by which its uniform grade was proved. The material breaks up readily, making it possible to operate the plant at high capacity and efficiency.

The present bed of the quarry grades down to 12 to 15 feet below the surface level. Blast holes, 5⅝ inches diameter and 12 to 14 feet in depth, are made by San-

derson-Cyclone drills and the shooting of a series of holes at one time breaks a month's supply of rock for the plant. The broken rock is loaded into 4-yard Continental side-dump cars by a steam shovel, and hauled to the foot of an incline over a 36-inch-gauge industrial track by a dinky locomotive, 16 such cars being in use. The loaded cars are drawn up the incline by cables attached to two motor-operated friction hoists and dumped into the crusher bin, which is 20 to 30 feet above the ground level.

The initial crushing is by a No. 36 gyratory crusher, driven by an Allis-Chalmers 200-horsepower motor through belt transmission. The crusher product is carried by a 36-inch bucket elevator to a scalping screen, 60 inches in diameter by 16 feet long. The material that passes the scalping screen is in marketable sizes and is carried on to bins; the reject, or oversize, from the scalper is recrushed in No. 7½ and No. 6 crushers. In the recrushing, screening and sizing that follow the scalping screen, four crushers are used—No. 7½ and No. 5 Allis-Chalmers, and two No. 6 Austins.

A belt conveyor operating below the crushers delivers the material to a Chalmers & Williams bucket elevator, 36 inches wide by 76 feet long, that stands at an angle of about 75 degrees and which discharges into a Traylor all-steel rotary screen, 60 inches diameter by 24 feet long; this is jacketed with ¼-inch wire, with 1⅛-inch square apertures, by which the undersize of 1 inch and smaller is passed and discharged upon a conveyor by which it is delivered to a second Traylor rotary screen, 48 inches in diameter and 20 feet long. The products of this system of screening consist of 1¼, 2 and 3-inch sizes from the 48-inch screen.

To prepare pulverized limestone for agricultural purposes, 1¼-inch rock may be conveyed from one of the bins to a set of 14 by 24-inch Buchanan rolls and a Williams pulverizer, the crushed material after undergoing a screening and sizing process, passing to fertilizer bins.

The two large Traylor revolving screens were sold by L. J. Hewes, Chicago district manager for the Traylor Engineering & Manufacturing Company.

The plant was designed by W. R. Sanborn, of Kankakee, general manager for the Lehigh Stone Company, who has had much experience in such work. Thomas Hunt is superintendent of plant and quarry.

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## Accident Prevention in Quarry Operation

Four years ago, at the Hannibal mills of the Atlas Portland Cement Co., we recognized the necessity of organizing our employes in such a way that they would be actively interested by representation in the safety and welfare work at the plant. About this time we organized our Committee on Safety and Welfare.

Committee on Safety and Welfare.—The committee originally consisted of three permanent members and six rotating members. The regular members selected were men whom we wished to train thoroughly in safety work and to act as leaders in the general movement. The balance of the members are grouped in lots of two, serving six months each, and after six months two of the members are replaced by two others, so that each year all departments on the plant are represented.

Naturally, departmental foremen were the first men selected, but, after operating the committee for four years, we now have the opportunity of training the general employes as well as their foremen. An alternate is appointed to serve in the absence of his regular representative and in the course of time it is usual, as vacancies occur, for the alternate to receive appointment as a regular member on the committee. As members of the committee we endeavor to select men who have in some way, by suggesting safety practices or otherwise, indicated to their foremen that they are interested in safety work.

additional railing through the middle of such stairway. Portable ladders should be provided with a tip to eliminate danger of slipping. Ladders used to get at overhead shafting should be provided with a substantial hook to fit over the shaft. Wooden ladders should have rungs substantially housed into the side rails and protected by a strip along the face of the sides to prevent the rungs from pulling out. Vertical ladders should have a good clearance between the center of the rungs and wall and where long ladders are used landings should be provided at proper intervals.

Work of Committee.—We have created throughout the plant the desire on the part of all men to become members of the Safety and Welfare Committee. This desire may in part be due to the fact that, upon being appointed to the committee, they are presented with a gold button symbolic of safety and welfare work. At the committee meetings are presented the various pamphlets which are issued by the Portland Cement Association and the National Safety Council, reports from the other plants of the Atlas Portland Cement Co., and a summary of the accidents at the local plant. The latter is carefully studied and the chairman of the committee appoints sub-committees to investigate and report upon certain accidents of an unusual nature.

Lectures on first-aid work are occasionally given, and the general plan is to keep the men thoroughly interested and enthused in the work so that each year we may turn out into the plant a few men that look upon "Safety First" as a responsibility instead of a mere slogan.

Enforcing Rules for Safety Measures.—There are places around some machinery which cannot be adequately protected by a guard, and when such places are encountered it is necessary to instruct, caution, or discipline against any unsafe or dangerous practice on the part of employes. We have found that certain guards are cumbersome and impracticable from an operating and maintenance standpoint, and when such is the case it is necessary to adopt and rigidly enforce rules against violating such measures.

When a safety rule is violated the disciplinary measure meted out to the employe sets an example before his fellow workmen which is of greatest value. We do not always find it necessary to discharge a man, unless by repeated carelessness he places not only himself but his fellow workmen as well in constant danger. For a first offense the man is instructed by a member of the Safety and Welfare Committee how to avoid a repetition of a careless act. On a second and third offense the man is disciplined by a lay-off of from 3 to 10 days. This usually suffices, and the man tries to protect himself as well as his fellow workmen, but occasionally a case comes up where we find, for the good of the service, it is necessary to discharge the offender.

Men who have been in the service for some time, through the routine of their duties, neglect necessary precautions and are apt to become careless around the machinery with which they have become familiar. The newer employes are not so apt to run into these heavy hazards, because they are naturally somewhat

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* From an address delivered before the National Safety Council by William H. Baker, Assistant General Superintendent, Atlas Portland Cement Co.

afraid of the heavy machinery in the plant, but due to their lack of knowledge of the possible hazards they do run into a lot of injuries in the handling of miscellaneous small objects, receiving minor bruises, burns and sprains. We take particular pains to instruct new men before putting them into the plant.

We have given particular attention to the guarding of shovels, gears especially being well guarded according to best practices. We particularly insist on steam shovel engineers making a careful inspection to see that everything is in good condition before operating and that no one is in the pit. No one is allowed to pass in front of the shovel while loading cars.

Picked Men for Extra Hazardous Work.—Of the number of men in the quarry, at least 75 per cent are engaged in operation such as stripping, drilling, blasting, hand loading, pit work at the shovels, track work, and general labor. We pick out men with the greatest possible care for the more hazardous work of loading holes, blasting, and hammer drilling under heavy banks. We instruct these men constantly, for we realize that by carelessness, in handling dynamite or drilling a block hole in a large rock—which may not be too well anchored—and similar work, they may cause injury to a large number of men. We try to instill in our men the thought that dynamite is made to go off and it may do so with the slightest bit of careless handling.

I believe the greatest hazard in any quarry is the constant danger of an accident involving a large number of men. This may come from a premature explosion of dynamite, especially if men are allowed to work in front of a bank which is being prepared for blasting. We take particular precaution against this danger, not only by careful supervision of the work, but the enforcement of disciplinary measures upon the men who violate any of our well-established rules.

Night Operation of Quarry.—I am not informed as to how many quarries operate at night, but at Hannibal we follow this practice and have been successful in keeping the number of night accidents down to a minimum. Night operation in a quarry requires good illumination at the shovels. On account of the constantly changing positions of shovels, it is not always feasible to illuminate the pit with electric lights. We formely used heavy-power lump carbide lamps, but the large-lump carbide generators are dangerous. We have been using, during the last year or so, a type of lamp which utilizes carbide in a compressed cake form. This cake is placed in a bell and by an ingenious arrangement the water is entirely withdrawn from the cake when the light is turned off and thus the gas does not continue to generate and permeate the atmosphere surrounding the tank with carbide gas which may be exploded by the lighting of a match close to the tank. Entire absence of gas around the tank at all times is a distinct safety feature in the use of this lamp.

Precautionary Measures in Moving of Raw Material.—In moving raw material from the quarry there are one or two precautionary measures that are necessary to follow up closely. One is to keep employes off the tracks and the other is to make the switchmen careful in handling cars. It is rare practice now to see a switchman open a coupler with his foot, but it was not so very long ago that the switchman seemed to enjoy waiting until the care were about 5 ft. apart, then preparing the couplers for proper connection with one of his feet. Switchmen should particularly be cautioned against running ahead of moving cars in order to throw a switch. We try to teach them that they should at all times keep within the range of vision of the engineer—this for their own protection.

Safety Appliances.—Where guards are used over gears, such guards should have sides to include the full depth of the teeth, and where spoke gears are close to platforms and passageways the sides should be protected. Railings for rear guards or along moving machinery should be a suitable distance from such machinery or else have a screen or solid guard along the side. Railings, wherever constructed, should be 42 in. high, with at least 6-in. boards. Posts should be of sufficient strength and well secured at the base.

All overhead platforms, floor openings and runways should be provided with properly constructed railings; should be kept clear of any obstruction or loose material which may be thrown down on the floor below or into moving machinery. All open stairways should have railings on both sides, the top rail should be 36 in. above tread. Closed stairways require only a single hand rail. Stairways over 43 in. wide should have an

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## The Link-Belt "Storage Loader"

The Link-Belt Company, of Philadelphia and Chicago, has brought out a modification of the standard Wagon Loader, which promises to have a variety of new uses. This is called a "Storage Loader", and consists of a regular Wagon Loader, on the front end of which is pivotally mounted a light belt conveyor, swinging in a semi-circle, and inclined upwards slightly. This runs at a speed sufficient to throw the material to some extent, and pile it in an open space to a depth of as much as 12′ to 13′.

The device is adapted to handle coal, gravel, sand, stone, or any other material of moderate size, and will be particularly useful in many plants for storing coal when it can be obtained in summer or fall, and reclaiming it as needed in winter.

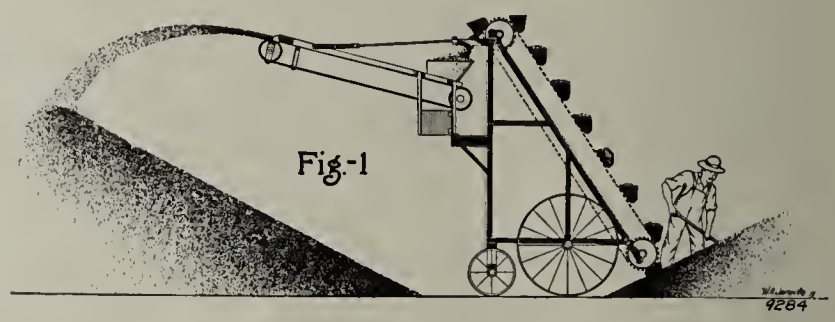


Fig. 1 illustrates the general operation of the Storage Loader.

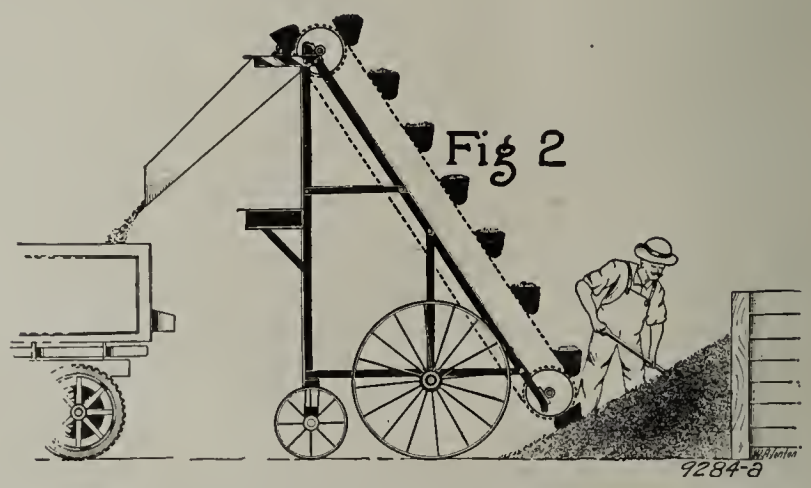


Fig. 2 shows the Wagon Loader portion, with the movable belt conveyor replaced by a plain chute, when it is desired to reclaim the stored material and deliver it to wagons or trucks.

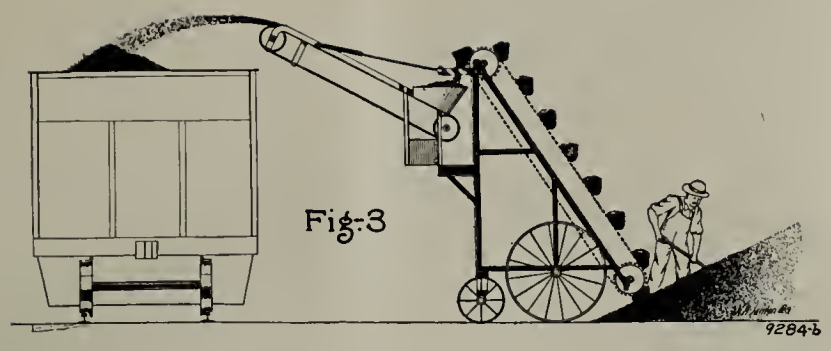


Fig. 3 shows how a Storage Loader can be used to load open railroad cars from the ground level. The throwing feature of the belt is here valuable in delivering the material at different parts of the car, thus avoiding hand labor in leveling off.

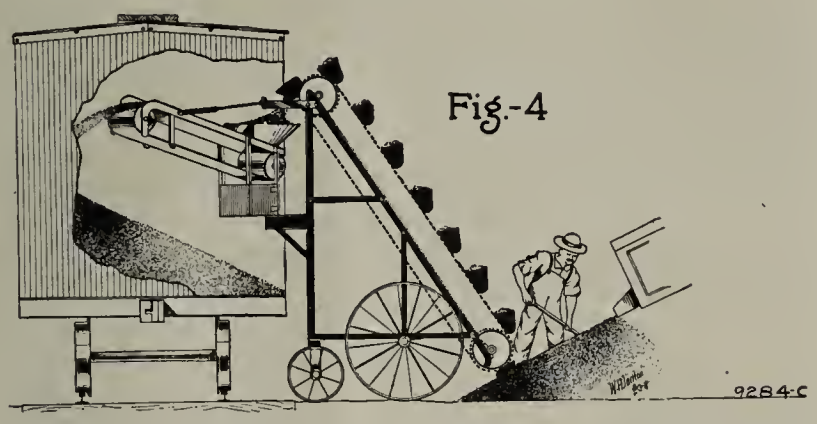


Fig. 4 shows still another use; namely, loading from ground level into box cars. Here material dumped near the track, is fed to the wagon loader, which delivers to the pivotally mounted belt conveyor. By pointing the pivoted belt to one end or the other of the box car, the car can be loaded to capacity, with practically no hand trimming, and with the use of only one man to feed to the loader at the foot wheel.

In these days of great scarcity of labor, this modification of the standard wagan loader may be found valuable in many kinds of work, by making it possible for one man and one of these machines to do the work formerly requiring three to six men using shovels and wheelbarrows.

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## As to Belt Conveyors

Jeffrey Belt Conveyors is the title of Catalogue 175 of the Jeffrey Manufacturing Company, 914 North Fourth St., Columbus, O. It will prove valuable to manufacturers, engineers and contractors who are interested in the saving of time, labor and expense in the handling of various materials. It is really a textbook on its subject, for, although compiled particularly to promote the advantages of using the belt conveyors of this make, it covers in detail the purchasers' requirements for information necessary to the application of the conveyors to obtain satisfactory service.

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## How to Determine Whether a Crushed Stone Stock Pile Pays

In the production of crushed stone throughout the year it is usually profitable to provide a stock pile, in spite of the extra cost of rehandling the stone. The main reason for this is that a smaller quarrying and crushing plant working continuously will produce the desired annual output at less cost per ton, inclusive of stock pile costs, than the cost per ton incurred by a larger plant, without a stock pile, working below full capacity most of the time.

Electrical engineers use the term "load factor" to denote the ratio of the actual annual output of electricity to the possible full capacity output of a plant. Thus, an electric generator of 1,000 kilowatts capacity is capable of generating 8,760,000 kilowatt hours of current in a year of 8,760 hrs. (i. e., 24 hrs. daily for 365 days). If, then, such a generator is so run as to generate 2,190,000 kw. hrs. in a year, its load factor is 25 per cent.

Since all the annual "fixed charges" on a generating plant are independent of the output, it follows that if the load factor can be doubled, the fixed charges per kilowatt hour will be cut in two. In general, then, the cost of the "fixed charges" per unit of output vary inversely with the load factor. This holds true of all plants, and serves to explain the economy of providing a stock pile for a crushed stone plant that can be operated the year around at a uniform weekly output.

Stone can usually be delivered to and loaded from a stock pile at a cost of 5 to 10 ct. per ton, depending on the scale of operations and the kind of plant used for stock piling and rehandling. Assuming the first cost of a quarrying and crushing plant to be $80 per ton of daily capacity, and that interest, depreciation and taxes are 20 per cent annually, we have 5.3 ct. per ton for fixed charges on a plant when run continuously one shift every day for 300 days. But without a stock pile continuous operation is usually impossible. To meet the "peak demand" for stone the plant must usually be fully twice the capacity required under continuous (one-shift daily) operation. This alone adds 5.3 ct. per ton of stone for fixed charges on the plant, or enough to cover the cost of stock piling and rehandling under ordinary conditions. But this is not the only element of cost affected by the "load factor" or output factor. A plant large enough to take care of peak demands for stone must necessarily have a crew of men capable of running it at its capacity, and most of this crew must be kept on the pay roll when the plant is operating at but a fraction of its capacity. Some of the crew must be paid even when it is not operating at all. So that either failure to secure freight cars regularly or a falling off in immediate demand for the stone results in the paying of full wages to most of the crew, regardless of the low output of the plant.

In the solution of a problem of this character the first step is to estimate the total annual tonnage of stone to be delivered. The next step is to estimate the maximum delivery that will be required for any single day, also for any single week, and for any single month. Then estimate the first cost of a plant that will supply the maximum daily output aided by the storage capacity of the bins, but unaided by a stock pile. Estimate the operating expenses, interest and depreciation charges for such a plant for a year, under the fluctuating daily, weekly and monthly outputs. Divide this total cost by the total annual tonnage and ascertain the cost per ton. Compare this unit cost with the unit cost resulting from operating a smaller plant continuously with the aid of a stock pile, including therein the interest on the average amount of money tied up in the stone in the stock pile. If the smaller plant with the stock pile shows a lower cost per ton (as it usually will) than the larger plant without a stock pile, then it is obvious that the smaller plant is more economic.

# How to Figure Construction Costs

**Address Delivered at the 30th Annual Meeting of the Iowa Engineering Society, Held at Waterloo, Iowa**

**By Stanley D. Moore, Waterloo, Iowa**

*No contractor, however small, should fail to read this article. While the text is taken from calculating sewer system construction costs, the sermon itself applies to every job, large or small. There is no moral lesson involved, but you can apply the subject matter to your financial profit on every job you figure.*

Not being an engineer and being connected with the contracting business, largely in a financial way, I have been able to observe the operation of the construction of municipal improvement from a semi-detached point of view. It has often occurred to me that there has been a deplorable lack of co-operation between all of the elements entering into the execution of a successful engineering project.

A sewer system, successfully constructed, might be described as one that properly meets the present and immediate future needs of the community, conceived and designed by an engineer who is competent, and whose remuneration is commensurate with the service he should render; built by a competent and responsible contractor, under a contract that is fair to all concerned, and at a price that makes it possible to carry out the intent and spirit of the undertaking without friction or litigation. Many projects will not come under such a classification. The fault is not all with the contractors, nor all with the engineers, nor the communities, but each contribute their share.

Trouble could largely be avoided if each of the elements mentioned would recognize that their interests are mutual, and if the work was undertaken in a spirit of co-operation instead of the too often prevailing attitude of antagonism.

There has been too much secrecy on the part of contractors, lack of frankness, and a failure to give real information. Too much suspicion on the part of communities, and a regrettable lack of consideration of the rights of the contractors by both engineers and communities. There has been too much guessing as to cost on the part of both contractors and engineers. It has been customary among engineers to figure costs of labor and material, taken from actual observation, plus ten per cent as a basis for estimates. Contractors, being a little closer to conditions, have been adding 15 to 20 per cent to such costs. Hence the usual discrepancy between the engineer's estimate and the bids received. I say usual, because for the present I wish to ignore the ridiculous bids of irresponsible and uninformed contractors, and the misguided efforts of responsible men who feel it their duty to meet such competition. Responsible engineers should not allow contracts to be let below their estimate. They should be broad gauged enough to know the fallacy of attempting to get something for nothing and should protect the community from inevitable trouble.

Recently the Federal Trade Commissioners conducted an exhaustive study of corporations in the United States and made the astounding discovery that less than five per cent of them were profitable. A similar study of the business of engineering and contracting would show that less than one per cent of those engaged are successful, or even solvent, and the answer to all this is "Overhead."

Overhead is very deceptive, because in this age of quantity production we have kept our eyes only on the lessened cost of the actual operation, and have forgotten that much of this saving is eaten up in overhead charges that did not formerly exist. That is why the price of commodities regulated by the government after scientific study of cost is usually raised, or at least established on a higher basis than the prevailing level. For instance: The unit basis for moving dirt by hand may be 25 cents per cubic yard. The same operation may be performed by a machine for 10 cents per cubic yard; but the overhead charges on the machine amount to all, if not more than the saving of 15 cents per cubic yard; the only advantage of the machine being a gain in time and an escape from labor shortage.

I have here an analysis of overhead charges taken from a compilation of actual records during the last five years of one-half million dollars in sewer contracts, running better than the average in soil conditions, at better than the average price, handled with better than the average efficiency, by a well-equipped, well-financed, and well-organized concern. I have purposely omitted the year 1917 from these records, because of unusual conditions and extra expense that would increase these overhead costs so much as to destroy their value as a record of average conditions.

**Table No. 1**

Based on contract price which turned out to be Gross Cost as business yielded no net profit.

| Items of Overhead | Average Cost for 5 yrs. | Estimated Cost for 1918 |
|---|---|---|
| Job Expense | 1.4% | 1.7% |
| Maintenance | .6% | .6% |
| Plant Repairs | 1.5% | 1.8% |
| Small Tools and Repairs | 1.1% | 1.3% |
| Depreciation | 1.0% | 2.0% |
| Incidental Material | 2.4% | 2.4% |
| Bonds | .7% | 1.7% |
| Insurance | 1.6% | 1.9% |
| Interest on Jobs | 1.1% | 1.3% |
| Discount | 1.0% | 2.0% |
| Promotion Expense | 1.8% | 1.8% |
| Office Expense | .6% | .7% |
| Salaries | 2.3% | 2.3% |
| Traveling Expense | 1.3% | 1.5% |
| War Tax | | .5% |
| Interest on Investment | | .5% |
| | 18.4% | 24.0% |

In the accompanying table I have divided the overhead costs on one-half million dollars' worth of sewer work and have predicted the probable increase in these costs for the year 1918. I should like to explain these items as follows:

Job Expense.—This is the cost of freight on equipment, miscellaneous drayage, the transportation of men, the expense of lost time for men receiving steady pay, the cost of bunk houses, storage and job office rent.

Maintenance.—Getting the job ready for acceptance after the main construction is completed and daily cost sheets stopped; care of streets and trenches, repairs under guarantee.

Plant Repairs.—The cost of repairs to machines and equipment, small tools and repairs, cost of tools lost and stolen, blacksmith repairs.

Depreciation.—This is a cost that every contractor has on his machinery and equipment and this item should be doubled at least to meet average conditions.

Incidental Material.—This item represents the cost of lumber, jute, dynamite, coal, gasoline, kerosene, cement sacks that are lost, rubber boots, etc.

Bonds.—This item represents the cost of surety bonds, the rate for which is high because so many bond companies have had to finish contracts for bidders who did not know how to estimate.

Insurance.—This item represents the cost of work-

men's compensation and public liability insurance, and will likely increase very materially every year.

Interest on Jobs.—This is not interest on investment, but interest only on money borrowed to carry on construction.

Discount.—This item should be five times as much as it is to meet the average conditions of the average contractor, but as this is a true record of actual costs of one firm it is thus set out, and is probably a much smaller amount than can be shown by any other contractor doing business in this territory.

Promotion Expense.—This item covers the expense of promoting jobs, dues to associations, etc.

Office Expense.—This item represents postage, telephone and telegraph bills and other expense of like nature that every business man must pay.

Salaries.—This item is entirely too small to cover conditions and is only intended to represent a very small salary drawn by the head of the firm who is sole owner of the business and gives his entire time to same. It probably should be called expense rather than salary.

Traveling Expense.—This item represents the expense of traveling to bid on jobs that you do not get, the expense of trips to jobs under construction, and the many trips necessary to the town after the work is completed in order to get final settlement.

War Tax.—This item must be a part of all estimates for 1918 and represents not only tax on any profits, but on postage, telegrams, telephone and freight bills.

Interest on Investment.—This item must be a part of all estimates of cost. Even the Tax Department of the Government admits it is a legitimate cost.

With these proven figures for overhead and assuming that we have accurate data on quantities and costs of material and labor, there remains in an estimate but the one item "profit."

Bearing in mind that a portion of the "profit" must necessarily be represented by investment in equipment on a reasonable basis of depreciation, what is a fair profit? The accepted basis is 10 per cent. That means that on a contract for $100,000.00 there should be a profit of $10,000.00, even though a portion of this is represented by equipment. I do not think this is enough to cover the hazards involved—but for purpose of illustration we will use it.

In almost all lines of business except the construction business all computations are made back from the selling price and not up from costs. As it seems necessary for us to work on the net cost of labor and material as a basis, we must make adjustments of percentages to produce the same result.

The table shows that "Overhead" for 1918 is 24 per cent of gross cost. Then the net cost of labor and material was 76 per cent of given cost. 24 per cent equals 31.7 per cent of 76 per cent. Or in other words, using net cost as a basis, the overhead charge is 31.7 per cent of the net cost of labor and material.

In order to yield 10 per cent net on the contract price the following computation must be used, although an engineer would express the same thing in an algebraic formula:

**Table No. 2**

| | | |
|---|---|---|
| Net cost of Labor and Material | = | 100.00% |
| Overhead 24% of 76% of given cost | = | 31.7 % |
| Gross cost percentage of net cost | = | 131.7 % |
| 10% of 100/90 of 131.7 | = | 14.7 % |
| Contract price percentage of net cost of material and labor | = | 146.4 % |
| Contract price to yield 10% net | = | net cost plus 46.4%. |

But a contractor cannot afford to do business on a 10 per cent margin for the reason that an increase of 10 per cent in labor cost, which is as close an estimate as can be made, and which is many times unavoidable, is enough to wipe out his entire profit. He cannot afford to figure less than 15 per cent, which means adding $53^{9}/_{10}$ to his net cost instead of $46^{4}/_{10}$.

The following list of items all enter into the cost of building sewers and I have underscored those which the contractor usually takes into account in making up his figures, but many items remain, all of which he must pay for, but which he fails to get into his estimate.

**Table No. 3**

| | | |
|---|---|---|
| Sewer Pipe | Attorney's Fees | Lumber |
| Jute | Taxes | Repairs |
| Bonds | Transportation | Shipping Delay |
| Insurance | Engineer's Errors | Office Expense |
| City Council | " Delays | Manholes |
| Cement | " Estimates | Drayage |
| Tools | Maintenance | Association Dues |
| Inefficiency | Labor | Promotion Expense |
| Depreciation | Bad Weather | Bad Luck |
| Interest | Freight on Tools | Traveling Expense |
| Errors | Straight Time | Hope |
| Salaries | Storage | Water Pipes |
| Bad Work | Discount | Gas Mains |

The question of "Overhead," while perhaps a recent development, is just as sure as "death or taxes." No contractor can get away from it.

He may be able to save on a few of the items but will go wrong on the others. If he looks only at the saving he is hiding his head in the sand. Many items of overhead have recently increased from 50 to 300 per cent. That is why many contractors have gone wrong who have their overhead included in their estimating tables and have figured increased cost on a general percentage. This charge for overhead may seem high, but is not as compared with similar commercial enterprises. For instance, the manufacturing business is similar to the contracting business. They take material and labor and sell a finished product and the average cost of overhead and selling expense in manufacturing is 70 per cent over the factory cost. The retailer, who has no labor to contend with, has an established overhead of 20 per cent, but no contractor can hope to equal such figures. Furthermore, the contractor's rate of turnover is slow and below the average.

To better his condition the contractor must first confer with the engineer. As a class the engineer is not unreasonable and is open to conviction, and the contractor must show him frankly the whole situation and convince him of his mistakes in estimating. A number of engineers have recently told me that they had never been able to get any real information from contractors, and would be glad to have a basis to work from.

The next trouble is with the communities, although they usually get their ideas from the engineers. If the price is too high, let them wait until they are ready to pay it. That is what other business men do, and it is better to let the job wait than to do it for nothing. Every community is better off if they pay a fair price and get a good job satisfactorily executed than if they try to get something for nothing and get skinned.

The irresponsible competitor is another factor that often originates with the engineer, who many times has a mistaken idea that the contractor is making a lot of money, and who therefore encourages some inexperienced person to enter the field of competition. It

is unfortunate that engineers are not compelled to do two years of contracting before they are allowed to practice their profession. They then would not get wrong ideas in their heads, and would not spend a lifetime trying to prove that their first impressions were right. Many methods of overcoming unreliable competition may suggest themselves; none of which, however, justifies the wrong idea that a contractor had better do work, even if there is nothing in it, than to be idle.

The last and greatest trouble is with the contractor himself. Let him get out of the old rut and start estimating properly, discarding all his old estimating tables, retaining only his records of labor, and material cost for his first basis in estimating; making proper allowance for increases in wages and material, and the ever-decreasing efficiency of labor; then include a proper percentage for overhead and profit.

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## Concrete Machinery on the William Penn Highway

In our October, 1916, issue we described the construction of the concrete road forming the first stretch of the William Penn highway extending from Easton, Pennsylvania, across Northampton County. This summer the State Highway Department of Pennsylvania has been extending this highway through Wilson township, the construction employing reinforcement and being similar in most other respects to the section first laid.

The contractors for this work were McInerny & McNeal of Easton, Pennsylvania. In response to our request to this firm that they inform us of any new methods or devices which they were employing in this work, they have replied that they found existing labor conditions made it necessary for them, as for other contractors, to employ every means possible for reducing the labor force. Chiefly with this purpose in view, this firm employed, on the William Penn highway construction, a Koehring concrete loading machine No definite figures had been taken to show the exact saving in labor or expenses secured by the use of this machine, but they find that it reduces the labor force by dispensing with all wheeling, saves the wages for idle labor when temporary delays occur in the work, and that it gives greater efficiency owing to the ease of operation which reduces the task of the individual laborer at the loading end of the mixer. This last item Mr McNeal believes to be one of considerable importance, in view of the independent attitude assumed by laborers at the present time. As to the first advantage, the importance or money value of this of course varies with the capacity or output of the mixer.

Mr. McNeal describes the machine as follows: "It consists of a belt conveyor carried on a trussed angle iron frame which can be raised or lowered by adjustments through a distance of ten inches. The total length of the machine is approximately 60 feet and the width about three feet. The aggregate is conveyed on a four-ply rubber belt 22 inches wide which travels at a speed of about 500 feet per minute. The capacity of the belt with continuous feed is approximately 100 cubic feet per minute. The conveyor is carried on steel trucks with automatic type knuckle steering axles having a standard gauge of four feet eight inches. There are two pairs of wheels 32 inches in diameter and with eight-inch tires. The machine is capable of turning in a radius of 63 feet. It moves forward under its own power at a speed of 70 feet per minute and reversed at 75 feet per minute. The operating power is a five horse-power, horizontal, four-cycle, hopper-cooled gasoline engine with five-inch cylinder and eight-inch stroke and making 426 r.p.m. The total weight of the machine and engine is about 6,000 pounds.

"Measuring cars constructed of steel with a top opening 36 inches wide and 48 inches long are placed on top of the carrier and can be adjusted for a capacity of from 3½ to 7¼ cubic feet, the adjustment being marked off by lines on the inside of each car. The height of the cars above the ground may be varied between 29 inches and 34 inches as necessity may require. The cars are stationary, but may be moved on wheels to any part of the carrier where they would be most convenient for loading. Each car has a lever attachment by which the material in it is discharged onto the belt conveyor. The sand and stone are shoveled into these cars from piles of these materials placed at convenient points along the road, and dumped from the bottoms of the cars onto the belt by means of a lever, and by the belt carried direct to the receiving chute of the concrete mixer at the end of the conveyor, by which chute it is discharged into the mixer drum in the ordinary way. The belt carries the material quite evenly without spilling and we have found it to be most satisfactory in its operation."

**Concrete Mixer at Work on William Penn Highway**

# Changes in Concrete-Road Practice in Wayne County, Michigan

### Slab Width and Thickness Generally Increased—Two-Mix Construction Proves Satisfactory—One-Way Roads Established

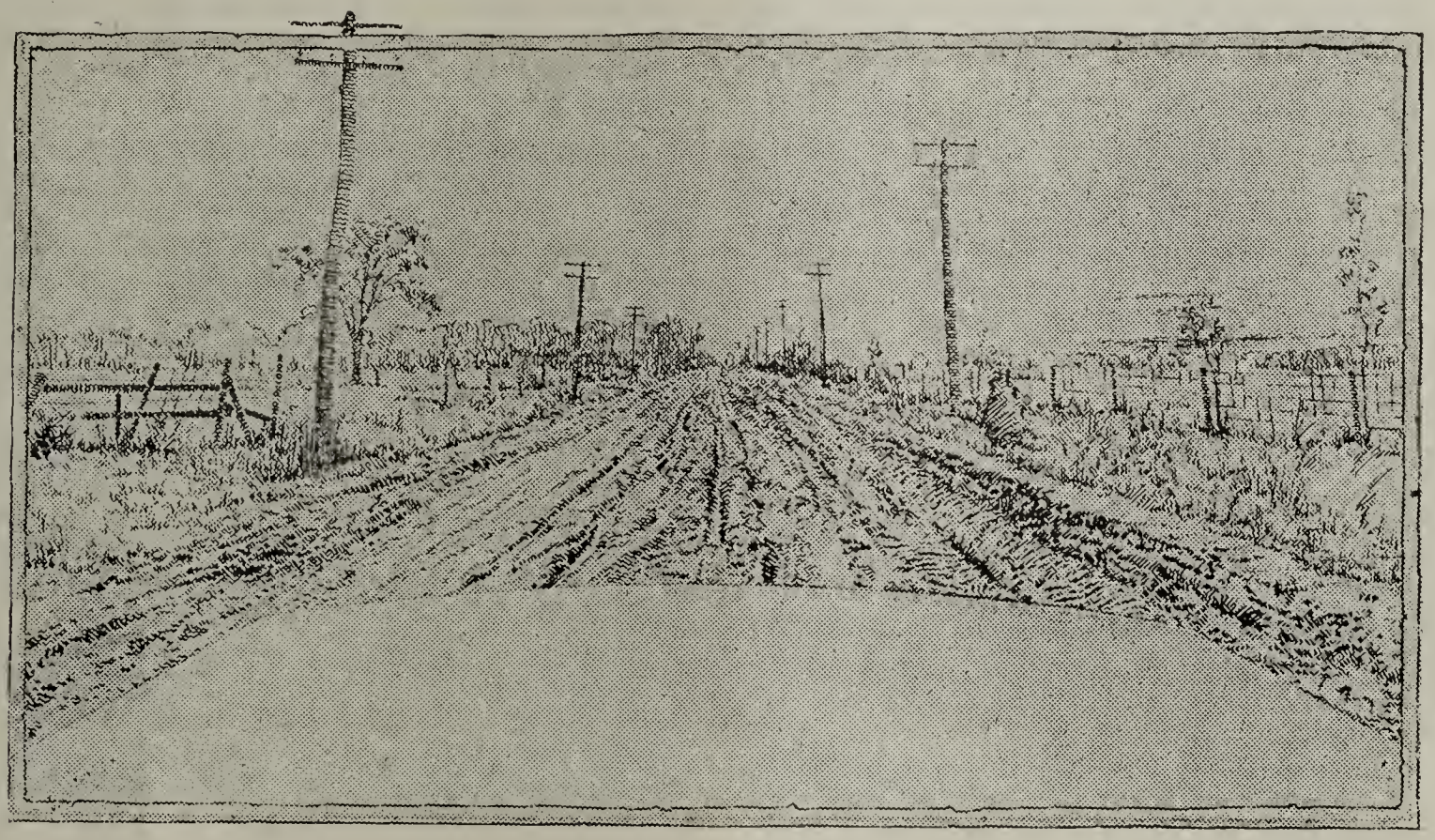
Practice on concrete-road construction in Wayne County, Michigan, has passed through many changes since it was inaugurated, and while the majority of these changes have not been drastic, in the aggregate they bulk large. Thus Edward N. Hines, chairman of the Board of County Road Commissioners, summed up the situation in an address before the Michigan State Roads Association at Detroit Sept. 3. During the past year the minimum width of road has been increased to 18 ft., and a width of 20 to 24 ft. is being recommended for the sections adjacent to cities. The slab thickness has also been considerably increased, and two-course construction, which was tried out a year or more ago, has been permanently adopted. Regulation of traffic on Sundays and holidays has been effected by establishing one-way roads in certain sections. A brief abstract of Mr. Hines' paper follows:

While all parts of the country report that the roads are going to pieces under heavy motor-truck traffic, brought about by railroad congestion and the desire of the public to move merchandise, in Wayne County, which on July 1 had 57,633 licensed passenger motor cars and 9,988 motor trucks of various capacities, not to mention thousands of motor trucks built for war purposes in Detroit and vicinity which use the roads, traffic has been carried over concrete roads seven, eight or nine years old, without any appreciable sign of wear. This experience emphasizes the wisdom and economy of building roads to fit the traffic, rather than restricting traffic to fit the roads, and it is against progress to regulate traffic to save a weak road, as such action will ultimately result in the destruction of the road itself.

To accommodate the increasing traffic the county road commission has increased the thickness and width of its roads during the past year, and believes that it is necessary to have a greater volume of concrete, irrespective of the mix, in order to withstand vibrations set up in the road by heavy, fast-moving motor trucks. It is the opinion of the commission that a well built concrete road will be eventually worn out not so much by abrasion as by vibration.

The road thickness has been increased from an average depth of 7⅛ in. to an average depth of 8¼ in., being 7 in. at the edges and having a flat subgrade and a crown of ¼ in. to the foot. This gives 8¼ in. at the center for an 18-ft. road.

While 18 ft. is the present standard width, the county commissioners are advocating to the Board of Supervisors, the body in which final control rests, the adoption of a 24-ft. concrete road which will be 32 ft. over all for roads built 10 miles out from the limits of cities. Some progress in this direction has been made on one of the principal jobs, connecting the Jefferson



## The Contrast Should Startle You

As your car swings along a clean, even stretch of concrete—and then onto an old-style unimproved road, you see and feel a contrast so sharp that you cannot fail to realize our great need of an efficient trans-continental chain of Permanent Highways of concrete.

The day will surely come when all your motoring will be done on this safe and comfortable kind of highway—the only type of road that can successfully meet the altered conditions of traffic brought about by the motor car.

There are encouraging indications of a vast awakening on the subject of Roads throughout the United States. By prompt planning, we can arrange for the quick-building of the concrete mileage needed, as soon as our men return from fighting and labor conditions readjust themselves.

Immediately the men now abroad are available for this most vital of America's reconstruction work, we should be ready to place in their hands the big job of rebuilding America's roads.

and Mack roads, which is being built 24 ft. wide. The main roads are already so congested with motor trucks and trailers that travel has become difficult and dangerous to the passenger car and horse-drawn vehicle, and it has been found advisable on Sundays and holidays to make the Jefferson and Mack roads one-way roads for 12 miles out from the center of Detroit and through a number of small villages, the traffic going out by the Jefferson road, crossing by the Vernier road to the Mack road for the return trip. A further advantage of the widening is the economy effected by eliminating the large expense of macadamizing and graveling the shoulders, together with the necessity for continual maintenance and oiling to keep down the dust.

Recently the county changed its specifications to two-course construction, substituting crushed Wisconsin granite or trap rock for pebbles in the wearing course. Despite the greater cost, the new construction is believed to be justified by the quality of the finished job. Fewer cracks develop in the roads built with crushed stone in the top course than in those built from pebbles. The use of the term "two-course" is somewhat of a misnomer, as the wearing surface is laid when the base is still wet, and it is compacted and becomes an integral part. A "two-mix" road would be a better term.

Several changes have been made in the use of expansion joints. While these are still placed at 25-ft. intervals, the thickness of the asphalt composition joint filler has been increased from ⅜ to ½ in., and the filler is placed just below the finished roadway, the concrete being carried over it with the strikeboard. Steel armored joints have been discontinued, owing to the scarcity and high price of steel and the difficulty in getting absolutely even joints. Excellent results have been obtained with submerged joints in eliminating irregularities, and when the film of concrete which covers them finally breaks, they can be maintained with Tarvia and coarse sand. The entire elimination of expansion joints is not considered good practice in Wayne County; rather, the county has increased the joint ⅛ in. in width.

The county has established a minimum of 100-ft. radius for curves, and, where necessary, extra right-of-way is acquired to obtain this radius. A policy of super-elevating all curves of 700-ft. radius or less has been established. This superelevation is obtained gradually so as not to be disagreeable to the rider. On sharp turns the pavement is widened out and the outer edge is banked 18 in. higher than the inner edge. Twenty-five miles per hour, the highest legal speed in Michigan, is the speed taken for computing superelevation.

Signposts of reinforced-concrete 10 ft. high and placed in a suitable concrete foundation are being erected at all important intersecting roads and are designed not only to be a permanent ornament to the road, but also to furnish useful and accurate information. They replace advertising signs and boards tacked on telephone posts or elsewhere, which are not allowed on the right-of-way of Wayne County roads. Provision is also made for placing electric lights on each post as soon as funds are made available, so that the traveling public may obtain distances and directions at night.

While it has been the practice of the county to keep all roads under its jurisdiction open for travel in winter as well as in summer, the importance of this work had not been fully appreciated until forced on the attention of the country at large during the severe weather and heavy snowstorms of last winter. This was particularly so on account of the congested freight-traffic conditions. No trouble was experienced at any time with snow on Wayne County roads, thanks to the efficient organization. Three superintendents have charge of road construction in the summer and have districts to take care of in winter. They are furnished with snow plows, scrapers, graders and shovels. Each superintendent is required to inspect his road and to have lists of men and team owners who will turn out for road cleaning. When a big snowstorm comes he gets at work in the shortest possible time. This method of taking care of the roads enables travelers to proceed in the usual manner and also prevents snow and ice ruts which concentrate traffic in one or two ruts.

---

## Concrete Post Is One of the Most Serviceable for Permanent Fences

The increasing scarcity of good post timber has caused the prudent farmer of today to consider well the future post supply. Throughout the greater portion of the United States the farmer has endeavored to meet this rising need by growing such timbers as the black locust, the catalpa speciosa, the osage orange, and the diamond willow for posts. The growing of these timbers for posts has not been altogether a success, however, as many of the plantings have been destroyed by insects, and the growth of other plantings has been interfered with as a result of planting on unsuited soils and as a result of unfavorable surroundings. This has caused many farmers to use materials other than wood for fence posts, and through this necessity the fence post of the future was produced.

Of the materials other than wood, used in making fence posts, the one nearest meeting the requirements of the ideal is concrete. Posts made of iron and steel may rust, and have only a fracture of the surface requirements necessary to prevent displacement within the soil when subjected to a severe strain. Even wood posts are destroyed by fire and decay. But this cannot be said of concrete posts. Neither fire, nor decay, nor the elements affect the durability of posts made of this material. Even Father Time, when he comes in contact with concrete posts, can leave only insignificant signs of his presence. In fact, concrete posts, when properly made, are very near the indestructible post. Being economical, serviceable and durable they come very near meeting all the requirements of the ideal fence post.

There are many styles of concrete fence posts; a few of these are very good, many are indifferent, and some are very poor. A good style of post to use for line posts is the tapering post. They are made 4½ by 5½ inches at the bottom, tapering to 3¼ by 3¾ inches at the top. Usually they are made about 7 feet long. This style of post is sometimes used for corner and end posts, but such posts are not at all satisfactory when used as such. Of course, when this style of post is used for end posts and corner posts they are made much larger; the size best suited for corner and end posts is 12 by 12 inches at the bottom and 8 by 8 inches at the top. One-fourth-inch iron rods are used for reinforcing the line posts; the end and corner posts are usually reinforced with ⅜-inch iron rods. A good corner post is one that will endure a tremendous side strain without lifting the post from the ground, displacing it, or breaking it at the surface of the ground. Such a post is the triangle corner post. When properly erected it is a corner post without a peer.

This corner post is made in the form of a double triangle, with one of the triangles at right angles to the other. This form of construction gives the post rigidity,

and at the same time eliminates the use of braces. The walls, constituting the triangles of the post, are about 7 inches in thickness, and are reinforced with ⅜-inch iron rods. These walls reach the height of 4 feet and 9 inches above the surface of the ground at the point where the two walls corner, and extend beneath the surface of the ground at least 3 feet. This type of post is constructed in position at the point where it is to be used, and the fence is attached to it by stapling the wire to heavy timbers which are clamped to the concrete by means of large bolts. The W. E. Dunn Manufacturing Company, 414 Twenty-fourth St., Holland, Mich., post molds make four to ten reinforced concrete fence posts at a time. The Dunn molds assure a higher quality post at a lower cost of manufacture. Write the W. E. Dunn Company for catalog.

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# The Stone Industry in 1917

### Increase in Value But Decrease in Quantity

The total value of stone sold in the United States in 1917 was $82,215,671, an increase of 4 per cent over the value of that sold in 1916. This increase followed an increase of 6 per cent in 1916 and a decrease of 4 per cent in 1915. The quantity of stone sold in 1917 was approximately 82,800,000 short tons, a decrease of about 9 per cent from that sold in 1916. The increase in value in 1917 was due entirely to the greater value of limestone sold, as the total value of all other varieties of stone sold was less, the decrease ranging from 1 to 11 per cent. An increase of 12 per cent in the value of limestone was due to a large increase in the output of stone quarried for use as furnace flux-from 23,623,508 long tons, valued at $13-946,882, in 1916, to 25,574,146 long tons, valued at $18,-679,213, in 1917. The production of limestone sold to industrial works, such as paper mills, sugar factories, glass works, and alkali works, also showed an increase in both quantity and value. The output of limestone for agricultural use, however, decreased 3 per cent in quantity, althought it increased 22 per cent in value.

Crushed stone amounting to 40,285,377 short tons, valued at $29,065,509, was produced in 1917, a decrease of 7,790,204 tons (16 per cent) in quantity and $397,043 (1.3 per cent) in value. The average value was 72 cents per ton in 1917, an increase of 11 cents.

### The Industry by States

Pennsylvania, Ohio, Vermont, New York and Indiana were the ranking states in value of stone produced in 1917 as in 1916. Of the 50 producing states and territories in 1917, two more (Nevada and Mississippi) than in 1916, twenty-six decreased and twenty-four increased the value of their output. In the region east of the Mississippi River 16 states showed increased and 11 states decreased value of output; in the region west of this river 8 states showed increased and 11 states decreased value of output; in the region west of this river 8 states showed increase and five decrease.

Wyoming made the greatest percentage of increase (142 per cent) in value in 1917, an increase due to a large output of stone for use in sugar factories. Delaware made an increase of 78 per cent in value, due to stone quarried for use by the United States Government at the Reedy Island breakwater in Delaware River. The percentages of increase made by Michigan, Alabama, Pennsylvania, West Virginia, and New Jersey (37 per cent, 34 per cent, 27 per cent, 22 per cent, and 12 per cent, respectively) were due almost entirely to the increase in the value of furnace flux.

# Production of Lime in 1917

The final figures for lime burned and sold in the United States in 1917 are 3,786,364 short tons, valued at $23,807,877, as determined by G. F. Loughlin, United States Geological Survey. This is a small increase over the estimate made in February, which was based on returns received from the principal producers, but it represents a decrease of 7 per cent from the total for 1916, which was 4,073,433 short tons. In spite of the decrease in quantity there was an increase in value of 28.6 per cent over that in 1916. Only 595 plants were in operation in 1917 in comparison with 778 in the previous year. The average price per ton, which for a number of years has been within a few cents of $4, rose to $6.29 in 1917.

The following table shows the output of all States that marketed more than 50,000 short tons:

**Lime Produced in 1917**

| State | Total Lime | | Hydrated Lime | |
|---|---|---|---|---|
| | Tons | Value | Tons | Value |
| Pennsylvania | 936,209 | $5,900,056 | 142,254 | $ 974,936 |
| Ohio | 479,856 | 2,975,466 | 316,252 | 2,038,944 |
| Virginia | 307,195 | 1,820,446 | 7,393 | 46,864 |
| W. Virginia | 245,569 | 1,268,343 | 51.545 | 274,718 |
| Missouri | 234,936 | 1,435,914 | 32,120 | 219,600 |
| Wisconsin | 169,650 | 1,037,578 | (a) | (a) |
| Michigan | 135,920 | 892,682 | (a) | (a) |
| Mass. | 134,937 | 916,569 | (a) | (a) |
| Maryland | 133,087 | 694,576 | 20,580 | 143,133 |
| Maine | 124,199 | 950,811 | | |
| Indiana | 118,530 | 646,555 | 21,867 | 134,835 |
| New York | 108,788 | 892,855 | 8,562 | 58,852 |
| Tennessee | 101,836 | 504,599 | 18,594 | 126,455 |
| Illinois | 83,409 | 501,320 | (a) | (a) |
| California | 78,401 | 597,528 | 3,512 | 31,529 |
| Alabama | 66,744 | 383,211 | 6,541 | 48,089 |
| Connecticut | 64,389 | 492,678 | (a) | (a) |
| Texas | 52,742 | 361,308 | 13,999 | 93,861 |
| Other States | 209,967 | 1,535,382 | 65,938 | 451,188 |
| | 3,786,364 | 23,807,877 | 709,157 | 4,643,004 |

(a) Included in "Other States."

The quantity of hydrated lime manufactured and sold in 1917 was 709,167 short tons, valued at $4,643,004, in comparison with 717,382 tons in 1916, valued at $3,626,998. This represents a decrease of 1.5 per cent in quantity and an increase of 28 per cent in value. The average price per ton of hydrated lime was $6.54 in 1917, an increase of $1.48 over the average price of 1916. The hydrated lime sold for use in buildings amounted to 402,223 tons, and that sold for use in agriculture to 177,815 tons, slight decreases from the previous year. There were 90 hydrating plants in operation.

**Lime sold in 1917, in short tons**

| | Total lime. | Hydrated lime. |
|---|---|---|
| Building | 1,313,597 | 402,223 |
| Fluxing | 209,976 | |
| Chemical works | 772,787 | 52,255 |
| Paper mills | 355,768 | 6,728 |
| Sugar factories | 47,546 | 5,227 |
| Tanneries | 66,629 | 13,979 |
| Glass factories | 60,624 | 3,277 |
| Agriculture | 488,297 | 177,815 |
| Dealers and others | 471,244 | 47,653 |
| | 3,786,468 | 709,157 |

There was a decrease in the quantity used for building and for agriculture, and an increase in that used for fluxing, chemical works, paper mills and tanneries.

A Beautiful Cement Stucco House in Los Angeles, Calif.

# Review of Stucco Tests by Bureau of Standards*

By J. C. Pearson

U. S. Bureau of Standards, Washington, D. C.

The first stucco tests were started in 1911, and consisted of small panels of metal lath, the majority of which were covered with cement and lime stucco in the approximate proportions of two-thirds part cement, three parts sand, and one-third part hydrated lime, by volume. These panels were erected primarily for the purpose of determining the effectiveness of various treatments or protective coatings of the metal itself in preventing corrosion. These tests (which are still in progress) have demonstrated conclusively that galvanizing is the most effective treatment of metal lath for its preservation, and that a coating of asphalt or "dip" offers a sufficient degree of protection to the metal to ensure its satisfactory durability under average exposure conditions. Many of the painted or dipped lath panels are still in excellent condition after nearly seven years' exposure, notwithstanding the fact that the metal is exposed on the inside and the construction not entirely weatherproof. Perhaps the most important lesson from these original tests, especially in view of later experience, was that corrosion of metal lath is one of the minor obstacles to the development of a successful stucco.

The tests made in 1915 were carried out on a large scale, under conditions that stimulate actual construction. The test panels were large enough to contain window or door openings, and to allow the plasterer the same freedom of action that he would have in a regular wall. Regardless of the distribution of stuccos, the concrete panels as a group have the highest rating, the plaster board panels the lowest. In these tests, the back-plastered metal lath panels probably take second place, and the gypsum block panels are near the bottom of the list.

### Method of Finishing Cause of Cracking

There were certain outstanding facts which furnished suggestions for future work. In the first place there was evidence that the prevalence of craze and map cracking on most of the 1915 panels was due to the method of finishing. It has been specified that a sand float finish should be used, and that this finish should be given in the shortest possible time after laying on the finish coat. The purpose of this was to avoid disturbing the so-called initial set of the cement. In consequence the very great majority of the panels were floated when too soft, which resulted in bringing to the surface a rich mixture of cement or cement and lime, subject to high shrinkage upon drying out. We believe now that this accounted largely for the general and early appearance of fine cracks on most of the panels, with some contribution also from the use of too rich mixtures.

### Cracks Resulting from Shrinkage of Sheathing

Another peculiarity that impressed itself upon us was the appearance of large and prominent cracks on all the panels over diagonal sheathing. These cracks invariably first appeared off the corners of the windows and running across the direction of the sheathing, and there is no question that they were brought into prominence, if not actually produced, by the shrinkage of the sheathing. The fact that these characteristic cracks did not appear on the back-plastered panels, and that the latter were largely free from prominent cracks, resulted in a higher rating for this group than for the metal lath panels over sheathing.

### Weak Base Common Cause of Stucco Failure

One other consistent development in these 1915 panels is of special importance, viz.: It was noted that the stuccos on the plaster board and gypsum block panels and on the monolithic concrete panel coated with bituminous waterproofing were in poor condition, especially after they had passed through the second winter. All of these were stuccoed with the standard mixture of one part

*Excerpts from paper presented at last annual meeting of American Concrete Institute.

cement, one-tenth part hydrated line and three parts sands, with only slight modifications in the method of applying. The results obtained on these panels indicate, not that this stucco is bad, but that the combination of this stucco and a weak base is bad. Field observations which I had an opportunity to make last year demonstrated this fact conclusively, that a strong cement stucco on a weak base is a common cause of stucco failure, and in practice this seems to occur most frequently in the application of brown and finish coats much higher in cement than the scratch coat, which logically should be the strongest portion of the stucco. The explanation of this failure must be sought in the well-known shrinkage of cement mortar upon drying out, and in the subsequent movements caused chiefly by varying moisture conditions.

### The 1916 Tests

In laying out the programme for the second year's work it was found most feasible to erect a sort of monitor or penthouse, providing twenty-two additional panels, on the roof of the original building. This, of course, precluded all but frame construction. The back-plastered panels had shown up so well in 1915 that it was decided to include a larger proportion of these in the new layout, and only one-half the monitor or annex, as it is more commonly called, was sheathed. To minimize the shrinkage effects 6-in. diagonal sheathing was used, alternating in direction on adjacent panels. It was decided also to change the method of finishing, partly in the use of less water on the under coats, and partly in waiting for the stiffening of the finish coat to develop before finally floating. This procedure, together with the use of a number of leaner mixtures, was adopted in the hope that craze and map cracks would be largely overcome. A number of special features were also included in certain panels with a view to minimizing the effects of movement of the wood frame.

### Deductions from 1916 Tests

The deductions from the 1916 tests may be summarized as follows:

1. Diagonal sheathing of unseasoned wood is apparently an unsatisfactory backing for stucco. With only unseasoned wood available horizontal sheathing would appear to better construction, provided sufficient bracing of the wood frame is assured.

2. Back-plastered construction appears to be best for frame structures, so far as the integrity of the stucco is concerned. This carried with it, however, a need for fuller information regarding the insulating qualities of walls so constructed.

3. Lean mixtures promise better cement stuccos, provided the necessary plasticity and density can be maintained by proper grading of the aggregate.

4. There is still need of further information as to the value of wood lath and high line stuccos. To date the tests indicate that wood lath is not as satisfactory as metal lath, and there is no conclusive evidence that a modern hydrated lime stucco will endure satisfactorily in severe climates.

---


## Concrete Stone Manufacture

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An Excellent Sample of Cement Stucco Work

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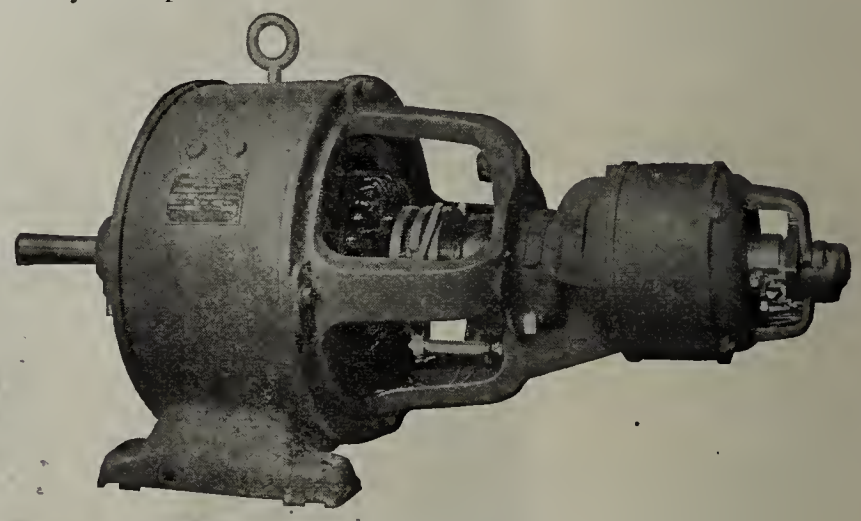

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## Excavating Buckets

Excavating buckets have been developed to have a wide field of usefulness with a high degree of efficiency and economy and have been specialized so much that it is not only possible to select a standard bucket particularly well adapted to almost any kind of ordinary service, but it is also possible to select buckets on the market that will perform several different kinds of service with almost equal advantage. All these buckets, however, load themselves in one manner or another and are not adapted to service in which their load is delivered to them.

Excavating buckets of all types are really independent machines operated by power driven steel ropes that also support them while being hoisted, lowered and transported. They are entirely self-contained and are ingeniously devised to develope great power and overcome large resistance while operated as flexible units. Great skill has been required to combine high power, speed, and durability with simplicity and has generally resulted in very heavy construction with special steel forgings and

with parts exposed to exceptional stress and wear made removable.

Excavating buckets vary greatly in size and capacity, running as small as 1 or 2 cu. ft., and as large as 10 yd. with an ordinary average of from ½ yd. to 2 or 3 yd. capacity. Under favorable conditions they may excavate and dispose of a load of material in half a minute or less, being theoretically able to handle 2,000 or 3,000 yd. of material per day for a large size bucket although, of course, their usual duty is far less. The bucket alone may weigh from 1,000 to 25,000 lb., with prices to correspond.

Electrically-operated Bucket Excavating in Sand Pit

The bucket can be used either on land or under water for digging, conveying, and hoisting almost any kind of material excepting solid rock and including boulders, hardpan, and shattered rock. They are employed for cellar excavations, trench work, sewer construction, irrigation work, canal digging, river and harbor dredging, railroad construction, and very largely for loading and nuloading sand, gravel, broken stone, coal, ashes, and for digging sand and gravel from rivers and banks. They are generally used for unloading concrete materials from cars where the latter are not self-dumping and for filling storage bins or for building storage piles and reclaiming materials from the piles to the bins or to the loading hoppers.

The scraper type of clamshell buckets is made without teeth and its cutting edge removes the surface of the material and fills the bucket. Buckets of this sort, made by The Link Belt Company, Chicago, are of several standard sizes and are adapted to many kinds of ordinary construction work. One of 2¾-yd. capacity, owned by the Perry-Victoria Sand Company, Buffalo, in one season twice handled 167,000 yd. of sand and gravel which it first unloaded from boats and then reclaimed from the storage piles and loaded directly to automobile trucks, cars, and loading hoppers.

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A Link-Belt clamshell bucket suspended from the boom of a wooden traveling derrick was installed, by E. Bennett, in a sand pit in Brooklyn where it excavated a large

Clamshell Bucket Discharging Sand and Gravel on Screen Over Loading Hopper

quantity of sand, much of it under water, and discharged it over an inclined screen mounted above a loading hopper in a movable tower. Large stones were rejected and the sand and gravel was afterwards delivered from the hopper to industrial cars hauled out of the pit by a cable operated by a hoisting engine.


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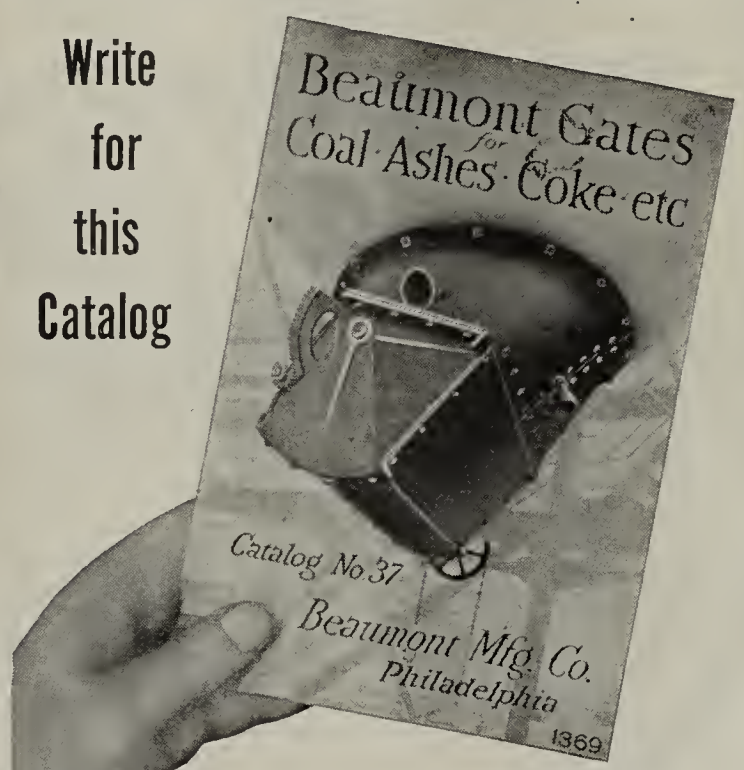


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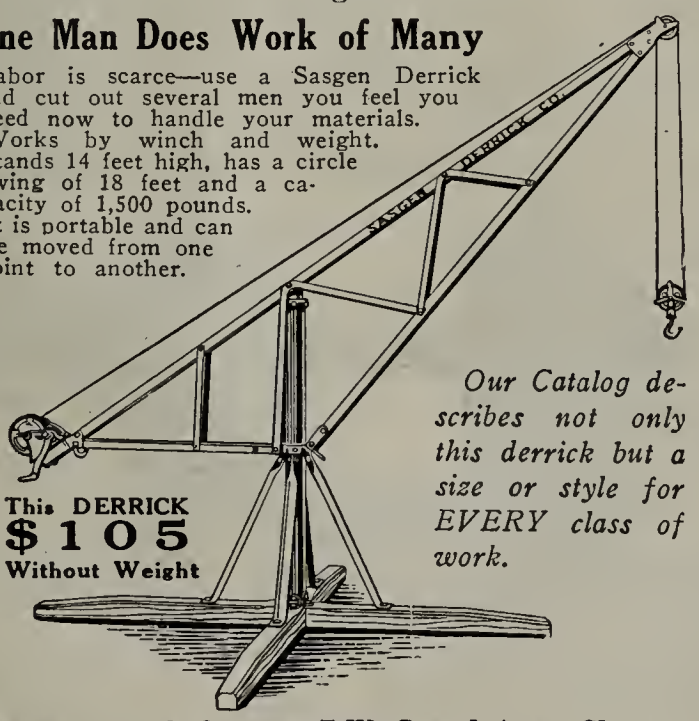



This DERRICK
**$105**
Without Weight

*Our Catalog describes not only this derrick but a size or style for EVERY class of work.*

**Sasgen Derrick Co., 3117 W. Grand Ave., Chicago**

## *Moderate in Price and with a Reputation for doing more than is claimed for them*

Jaeger Mixers **make** good because they are **made** good. No useless parts—no skimping. They are big enough for the big jobs and not **too** big to handle the little ones with profit.

And there's a Jaeger Mixer that just fits **your** needs.. Let us tell you about it.

**The Jaeger Machine Company**
212 Rich St.
Columbus, Ohio

Pavers, Grouters, Hoists, Pumps,
**BOSS** HIGH SPEED
Building Mixers, Backfillers, Elevators

**Contractors' Equipment**
BUILT OF STEEL WITH HYATT ROLLER BEARINGS

ASK ABOUT OUR HIGH DRUM TWO BAG PAVER

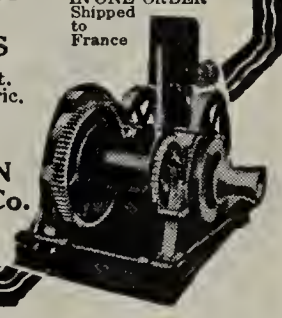
$250 BUYS LOW CHARGER

Astonishingly Low Prices
--Cash or Terms--
PROMPT DELIVERIES

All sizes from 5 ft. to 22 ft. cap., Gas, Steam or Electric. Complete stock carried in or near your city.

THE AMERICAN Cement Machine Co. Inc.
Keokuk, Iowa

OVER 100 SOLD IN ONE ORDER Shipped to France



**CALDWELL'S HELICOID**

HELICOID Screw Conveyor is heavier, stronger and better made than any other. Requires fewer repairs —no lapped and riveted joints to come apart—flight all one piece. Special hangers, bearings and boxes for cement work. If you have anything to do with the manufacture of cement, you should write for our Catalogue.

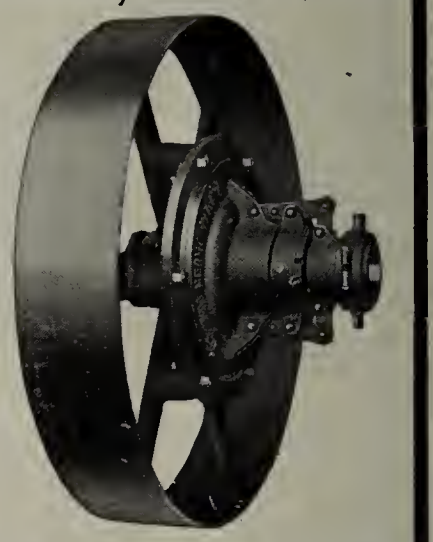
Elevating, Conveying and Power Transmitting Machinery.

**H. W. CALDWELL & SON CO.**
17th Street and Western Ave., CHICAGO
NEW YORK, Fulton Bldg., Hudson Terminal, 50 Church St.
DALLAS, TEXAS, 711 Main St.

# LITTLE DAILY LEAKS OF POWER BOOSTS YOUR COAL BILL

The High Cost of Power Is Reduced to a Minimum By the Use of a

## Plamondon Disc Type Friction Clutch



The power of this clutch is unusual. The double toggles on this clutch develop such tremendous pressure that even on the largest clutches only a hand lever is needed to engage or disengage the clutch. The geared devices usually needed to operate large clutches are unnecessary.

This is only one of the practical advantages the cement mills find in this clutch. Write for our new catalog No. 59 and learn the rest of them.

WE ALSO MANUFACTURE GEARS

**A. Plamondon Mfg. Co.**

12-24 N. Clinton St. CHICAGO, ILL.

# Cut Gears

Spur,
Spiral,
Bevel and Worm
Steel and Rawhide

*Accuracy and Prompt Delivery*

When you want a gear cut you want it **quickly,**—we emphasize our promptness without sacrificing accuracy.

## Ganschow Cut Gears

stand first in accuracy—perfect mesh—silent operation and the quality that counts for long service.

*Estimates furnished from drawings and specifications.*
*WRITE FOR CATALOG.*

**WILLIAM GANSCHOW CO.**

1003 W. Washington St. - CHICAGO

## SOPER ENGINEERING CO.

ELLIS SOPER, PRESIDENT
CHATTANOOGA, TENN.

Designing, Constructing and Operating Engineers and Contractors

Cement Plants and Reinforced Concrete Bridges a Specialty

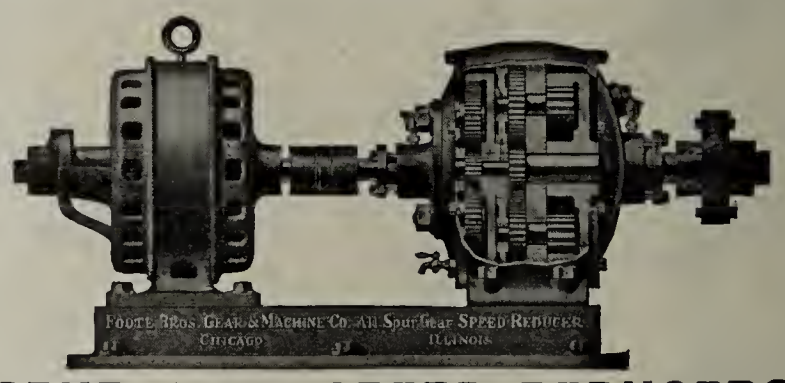
## WEBER REINFORCED CONCRETE CHIMNEYS

Coniform and Cylindrical Types Hundreds In Use

WEBER CONIFORM CHIMNEY

**The Weber Chimney Company**

1453 McCormick Building - CHICAGO, ILL.




## SPUR GEAR SPEED REDUCERS

Note they are dust proof, compact, made in any horse power or reduction. Just what is needed on conveyors, elevators and reduction of speed anywhere. We manufacture cut gears. Send for catalogue.

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203 North Curtis St., Chicago

# Pebbles for your tube mills

**Superior to Flint Pebbles and Will Not Break**

Tested by Engineers and Chemists
Shipments Promptly Made
Satisfaction Guaranteed

**Peruvian Tube Mill Pebble Co.**

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# BALLS

Forged steel balls of special analysis steel from 2" to 15" in diam. carried in stock. Can't be excelled.

BALL MILL PLATES
CRUSHER SHAFTS
GRIFFIN MILL SHAFTS
GRIFFIN MILL CONVEX SEATS
GRIFFIN MILL CROSSHEADS
PIPE FLANGES
for High Pressure Work
STEAM SHOVEL, TRUCK AND CAR AXLES

**Hammer and Hydraulic Press Forgings of all kinds**

*We make quick service a feature of our business*

**TIOGA STEEL & IRON CO.**

52nd AND GRAY'S AVENUE, PHILADELPHIA, PA.

# IMMEDIATE DELIVERY

"Franklin"

ROUND—SQUARE—FLAT—SQUARE TWISTED

## STEEL BARS

for CONCRETE REINFORCING

We can meet your Reinforcing Steel Requirements. This means not only quick shipment from the mills but co-operative service for rapid transportation. If you want to know just what your exact cost will be, send us the Blue Prints and we will give you a lump sum bid on all the steel sheared to lengths, bent to specifications and delivered to the job,

*Our Engineering Department is at your service.*

**The FRANKLIN STEEL WORKS**

FRANKLIN, PENNA.

Cleveland, 1320 Rockefeller Bldg.
Boston, - - 12 Pearl Street
Philadelphia. 2215 Race Street
New York, - 30 Church Street
Chicago, - - 332 So. Michigan Blvd.
Buffallo, - Erie County Bank Bldg.
Pittsburgh, Oliver Bldg.

QUALITY SERVICE

# Inland Deformed Bars

In Open Hearth Steel (New Billet Stock), Hard Grade, and Rail Carbon Steel (Rerolled).

The mechanical bond is theoretically correct and is guaranteed by us, having been designed by expert concrete engineers and approved generally by engineers and architects.

The corners are rounded to prevent splitting of the concrete. Bending, fabricating and setting are easily done with these bars. Sizes ⅜ to 1¼ inch. Lengths up to 85 feet.

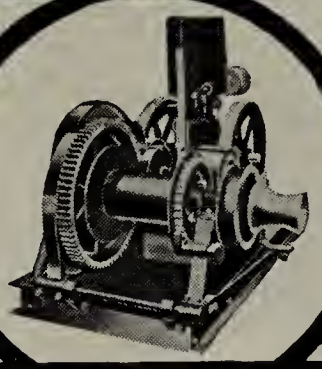
Prompt shipments during 1918.

**INLAND STEEL COMPANY First National Bank Bldg., CHICAGO**

# Boss 'HEAVY DUTY"

## Contractors' Hoists

Gasoline — Kerosene or Electric Power—reliable as steam. Absolutely dependable. $5 to $10 a day cheaper to operate. Three sizes—6, 8, 10 H.P. Three speeds—100, 150, 200 ft. Rope Travel. Hyatt Roller Bearings. Prompt Deliveries. Write, wire or 'phone nearest branch office.



Over 100 Ordered for USE "SOMEWHERE IN FRANCE"

**THE AMERICAN CEMENT MACHINE CO., Inc., Keokuk, Iowa**

BRANCH OFFICES—New York, N. Y.; Cambridge, Mass.; Richmond Va.; Pittsburg, Pa.; Cleveland, O.; Indianapolis, Ind.; Louisville, Ky.; Chattanooga, Tenn.; St. Louis, Mo.; New Orleans, La.; Chicago, Ill.; Minneapolis, Minn.; Denver, Colo.; El Paso, Tex.; San Francisco, Calif.; Seattle, Wash.; Spokane, Wash.

# Luten, Roberts & Titus

INDIANAPOLIS

*Designing and Consulting Engineer*

*Reinforced Concrete Bridges Exclusively*

Associate Engineers in each State

BECAUSE WE SPECIALIZE ON

**Lock Seam Pipe** with the smooth inside surface, having already furnished large quantities for Potash Recovery plants, we are able to give especially careful attention to the construction of this class of Pipe.

**Robertson Bros. Mfg. Co., Chicago**

# 225,000 TONS OF STONE

were recently shot down in one blast at the Steelton, Pa., Quarry of the Bethlehem Mines Corporation at a cost of about 3.8 tons per pound of powder and 29 tons per foot of hole drilled.

The blast consisted of 79 six-inch blast drill holes averaging 96.8 feet in depth, the shallowest of which was 64 feet and the deepest 120 feet. Total of feet drilled was 7,648.

In all the holes of this blast were loaded a total of 23,600 pounds of 50% powder and 35,250 pounds of 40% powder.

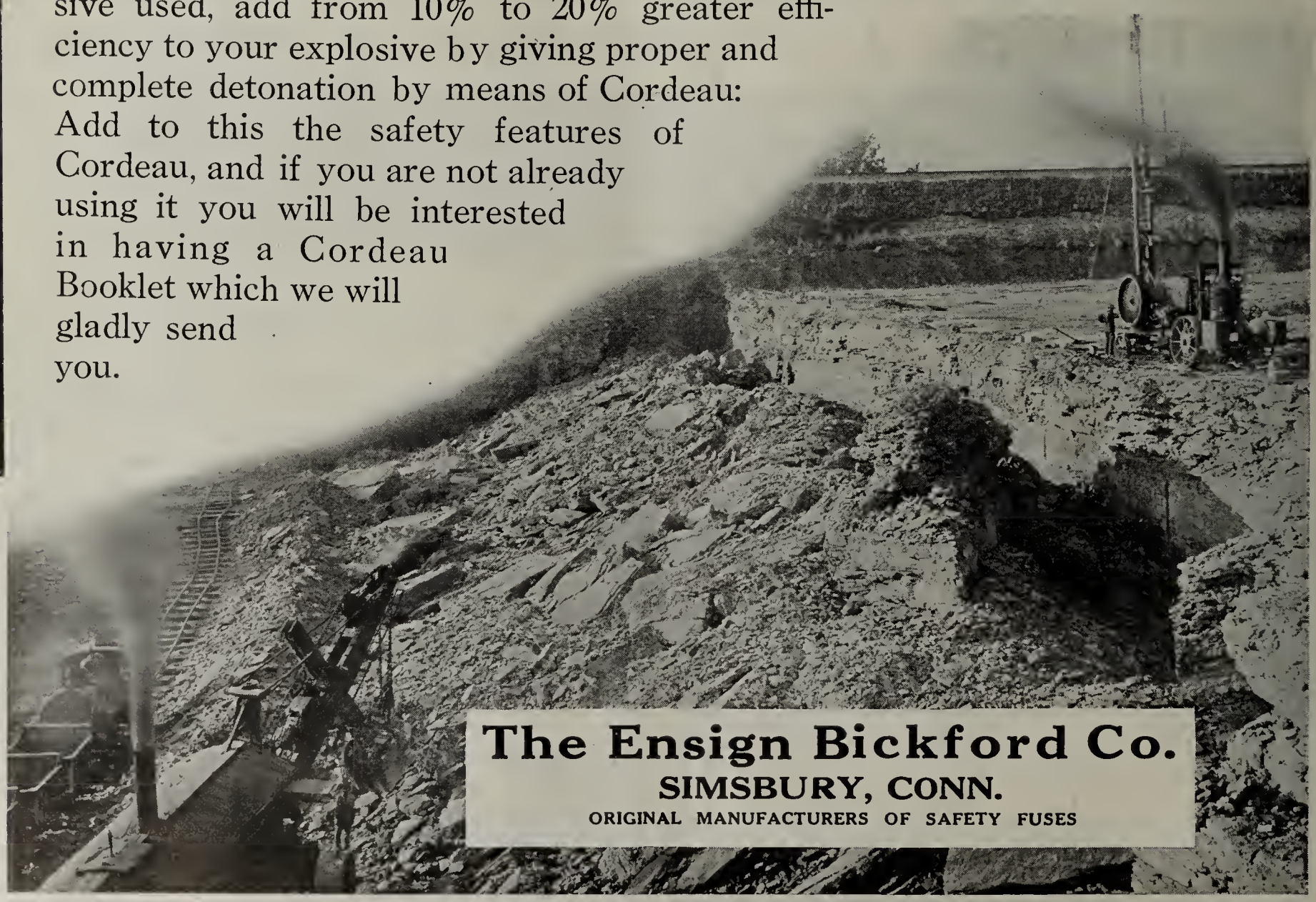
## FOR SAFETY AND EFFICIENCY

***COTTON COUNTERED***

# Cordeau-Bickford Detonating Fuse

was used in each hole and plain Cordeau for the "lead." 7,700 feet of the cotton countered fuse was used and 1,400 feet of the plain.

In a blast of this magnitude consider the amount and value of the explosive used, add from 10% to 20% greater efficiency to your explosive by giving proper and complete detonation by means of Cordeau: Add to this the safety features of Cordeau, and if you are not already using it you will be interested in having a Cordeau Booklet which we will gladly send you.



**The Ensign Bickford Co.**
**SIMSBURY, CONN.**
ORIGINAL MANUFACTURERS OF SAFETY FUSES

# STEEL BARS FOR Reinforcing Concrete

OUR SERVICE
ESTIMATING
SETTING AND BENDING DETAILS
BENDING

PLAIN AND DEFORMED ROUNDS AND SQUARES

Shipments from Stock and Mill Rolling

## CALUMET STEEL COMPANY

CONTINENTAL AND COMMERCIAL BANK BUILDING
CHICAGO

## THE FULLER ENGINEERING COMPANY

**Designing, Constructing and Operating Engineers**
**Cement and Hydrated Lime Plants a Specialty**

**Reports, Examinations and Analyses of Raw Materials for Cement Consultations Solicited**

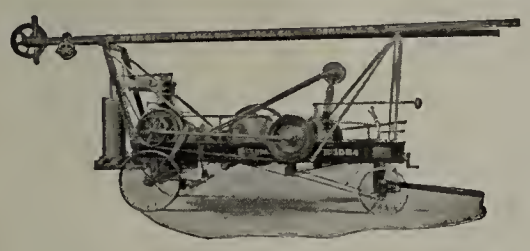
**Offices: Allentown National Bank Bldg.**
**ALLENTOWN, PA.**

# WATER

WE-FU-GO AND SCAIFE
PURIFICATION SYSTEMS
SOFTENING & FILTRATION
FOR BOILER FEED AND
ALL INDUSTRIAL USES

WM. B. SCAIFE & SONS CO. PITTSBURGH, PA.

## A Big Blast-Hole Drill That's Reliable



### The Cyclone No. 14

Heavy, solidly braced frame — Sill timbers 4" x 14". All machinery placed directly on the main sills protecting it against strains and preventing top heaviness. **Eighty per cent (80%) of the castings are cast steel**—not cast iron. The Cyclone No. 14 is the only Blast-Hole drill so built. Furnished in Steam, Gasoline, Compressed Air or Electric Power; traction or non-traction.

**The Sanderson Cyclone Drill Co., Orrville, Ohio**
**Eastern and Export Office, 50 Church St., New York, N. Y.**

# PULVERIZED COAL EQUIPMENT

AERO PULVERIZER CO., 120 BROADWAY, N.Y.

## WOULD YOU USE AN INTERMEDIATE SYSTEM FOR CONVEYING YOUR FINISHED GRAVEL FROM PLANT TO CAR IF YOU COULD SPOT THE CAR UNDER THE SPOUTS OF THE BIN?

Not If You Could Help It Would You?

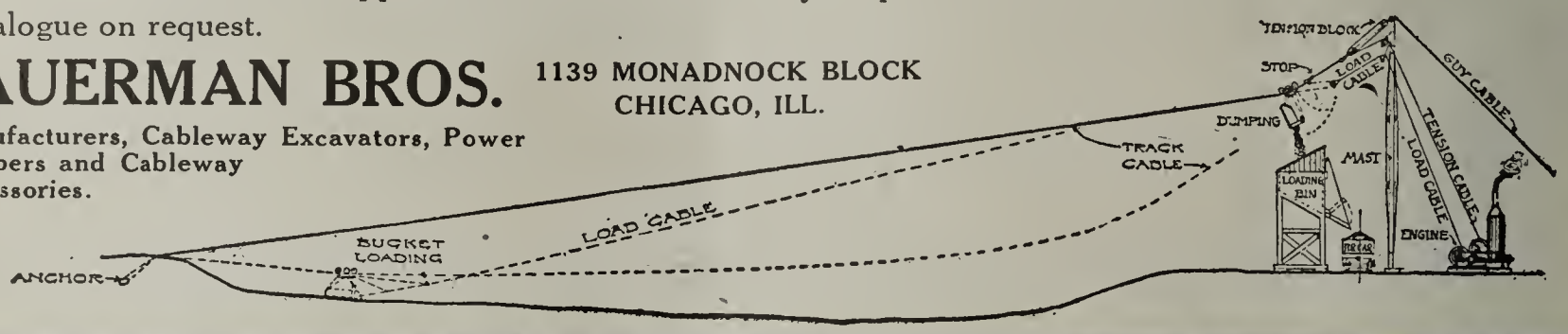
Then is it not just as logical to do away with an intermediate conveying system between **pit** and plant?

Are you using one machine for digging the material and another to convey it to the plant when you could just as well use one machine for the combined operation, saving the additional labor, machinery and upkeep cost?

The Sauerman Dragline Cableway Excavator is digger, conveyor and elevator combined in one.
It is the direct method from pit to plant.
It digs, conveys, elevates and dumps in one continuous forward operation.
Operated by a double drum friction hoist under one man control.
One Machine—One Operation—One Man Control
If you are interested in the application of this machine to your plant write us for further information.
Catalogue on request.

**SAUERMAN BROS.** 1139 MONADNOCK BLOCK CHICAGO, ILL.

**Manufacturers, Cableway Excavators, Power Scrapers and Cableway Accessories.**



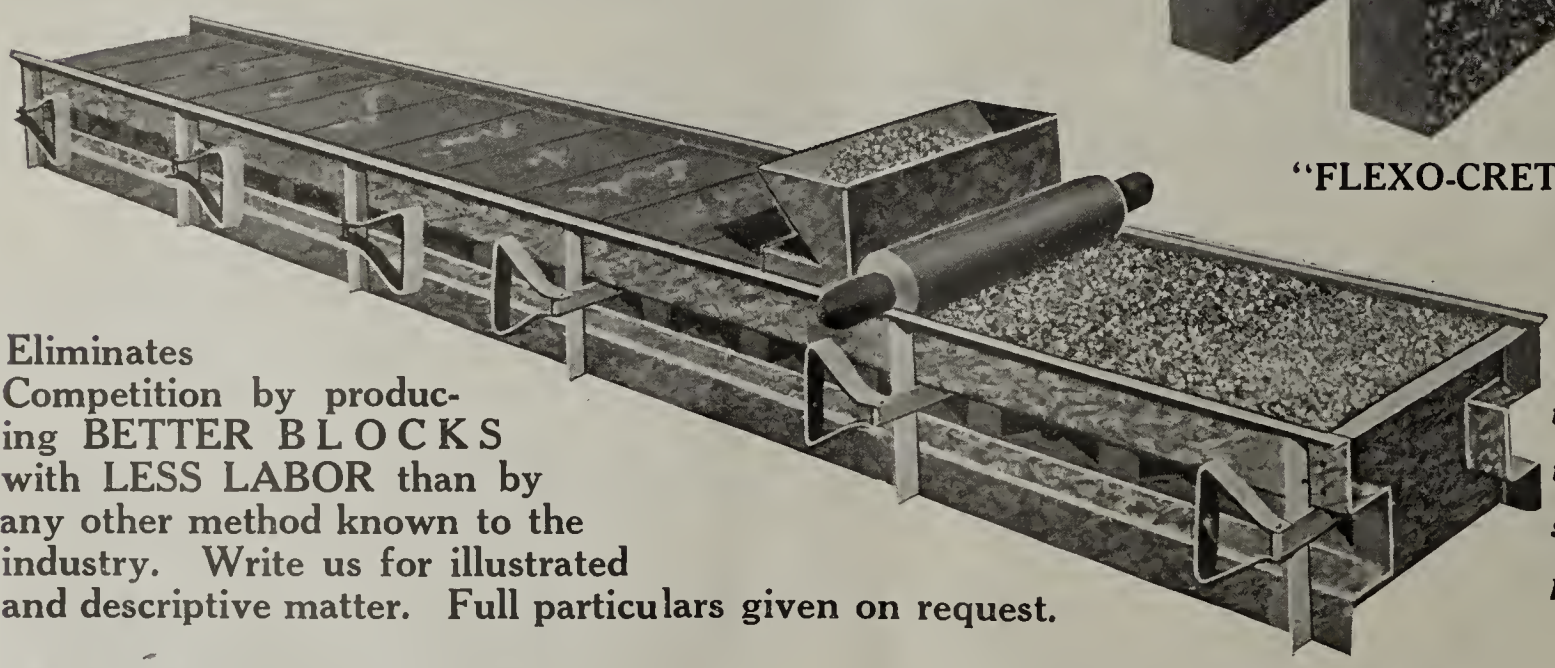

# Flexo-Galvanized Steel Moulds

For Producing

# Poured Concrete Building Stone

Greatest Labor Saving Device of the Times.
A God send to the Building Block Industry.

"FLEXO-CRETE"



Eliminates Competition by producing BETTER BLOCKS with LESS LABOR than by any other method known to the industry. Write us for illustrated and descriptive matter. Full particulars given on request.

*We ship on thirty days trial to responsible parties.*

**Flexo-Concrete Mould Company.** **Cedar Rapids, Iowa**

**Northwestern Steel Forms**

Recommended by leading engineers as standard for construction of sewers, culverts, flumes, drains, tile and similar work. Save money, man-power, time and trouble. Standard or special sizes in round or elliptical form. For full information, write for Bulletin No. 29.

NORTHWESTERN STEEL & IRON WORKS

Eau Claire, Wisconsin — Capital $200,000

**BELTING**

"V-B" Balata
"AMPERE" (Canvas Stitched)
"WHITE SEAL"

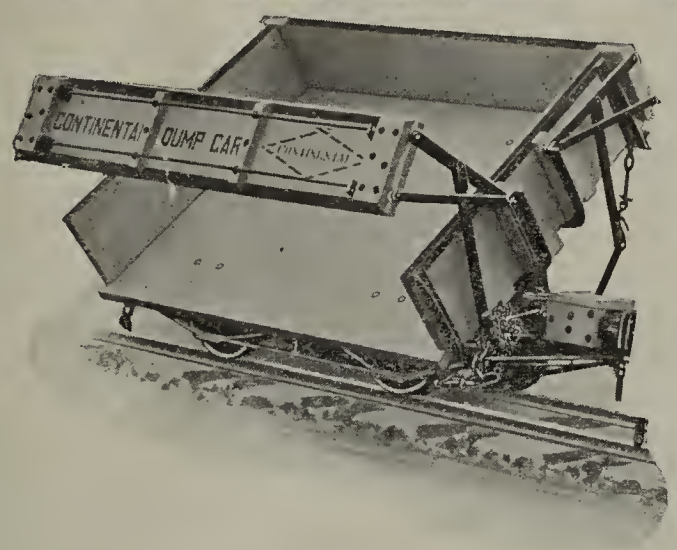
Write for Prices, Discounts and Samples

VICTOR BALATA & TEXTILE BELTING CO.

Factory: Easton, Pa. Main Office: 38 Murray St., New York
Stores: 167 N. Market St., Chicago, and 87 High St., Boston

CONVEYOR BELTS A SPECIALTY

**Stamina!**




ABILITY to stand up under the most gruelling tasks—under the most severe strains— has made the Continental name a by-word across the nation.

**CONTINENTAL DUMP CARS**

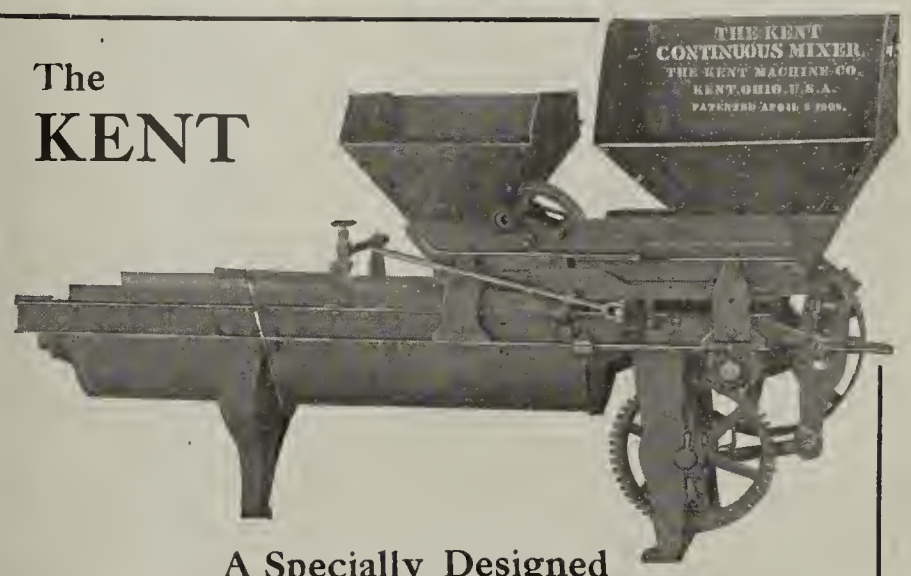
are noted for correct design, sturdy construction, highest grade of materials and workmanship, and they incorporate many new features not found in other cars.

*Write us concerning your needs*

**Continental Car Co. of America, Inc.**

General Sales Office and Works, Louisville, Ky.

The **KENT**




A Specially Designed

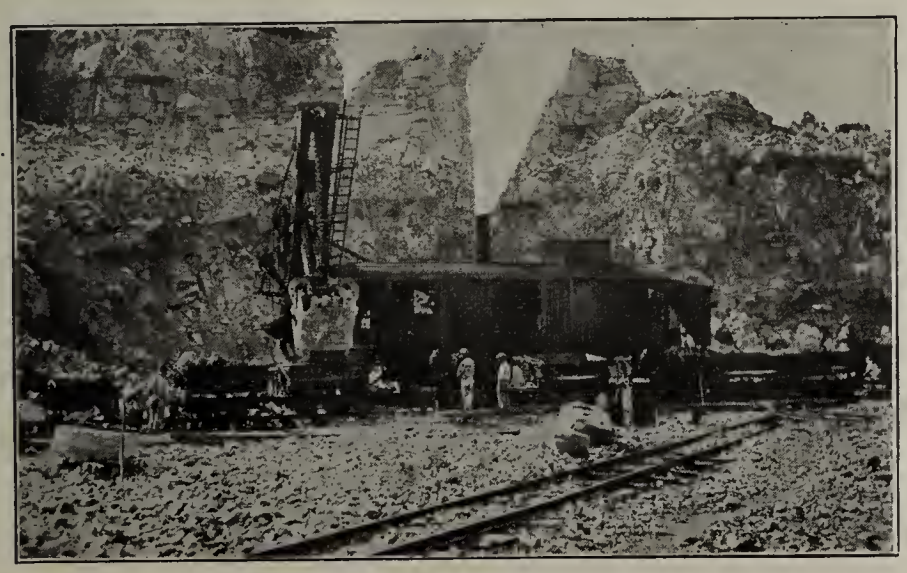
**Mixer for Products Plants**

Seventy per cent of the bigger block, tile, brick and specialty concrete products plants of the country use the famous Kent Mixer.

Equipped with automatic feeding device, it makes certain a proper proportioning of aggregates and being continuous in operation, it saves time and labor. The biggest concrete products plant in the world has found that four Kent machines will mix fast enough to keep its many tampers and mold machines busy.

**Write today for descriptive literature and prices.**

**THE KENT MACHINE CO.**
**Kent, Ohio**



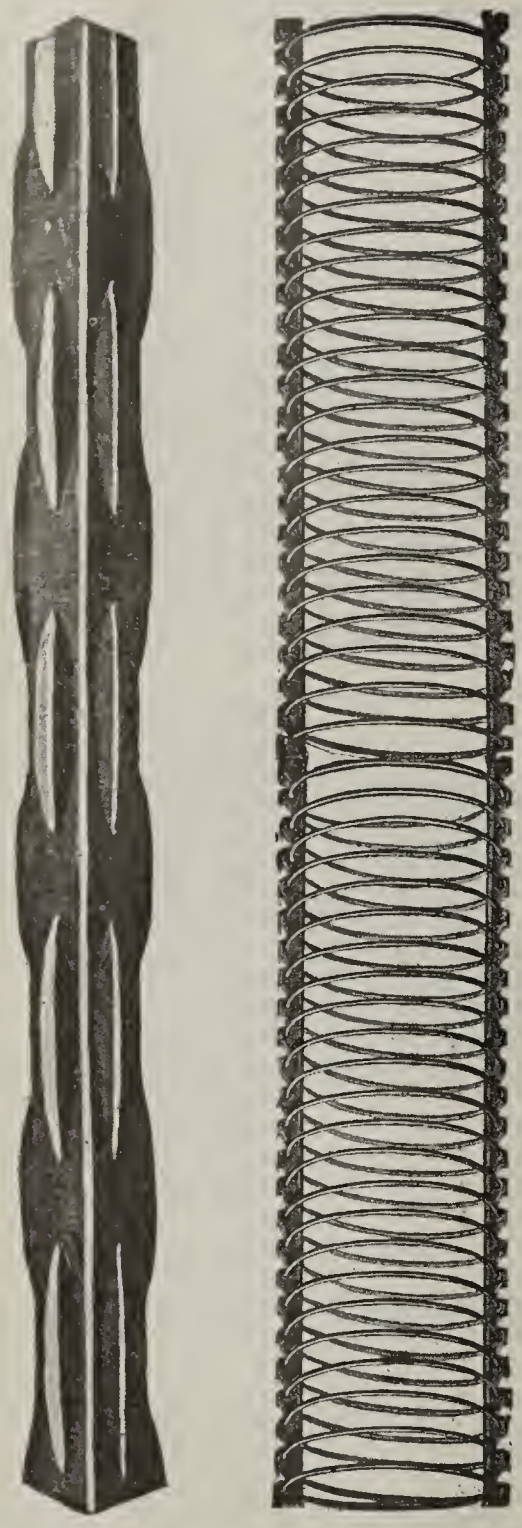
**Western Dump Cars for Stone Quarries**

**We Build Them Strong. They Are Made of the Very Best Material**

This interesting picture taken in an Arkansas stone quarry. One mule draws a 2-car train to the crusher. One of many industrial uses for Western Dump Cars. They are used for hauling all kinds of material in all parts of the world.

*Write for Catalogue and Prices*

**Western Wheeled Scraper Co.**
AURORA, ILL.



# STEEL BARS AND SPIRALS FOR REINFORCED CONCRETE CONSTRUCTION

# "Bars on the Job Ready for Your Men"

Delay, caused by the failure to have your reinforcing material on the job not only throws out your calculations but also the schedule of every other contractor on the job.

You can save the loss of much time and money by specifying Havemeyer Bars for your reinforced concrete work.

Their prompt service insures your having bars on the ground when the men go to work.

## HAVEMEYER BAR

Service insures direct shipments of reinforcing steel from our Chicago warehouse, which is located within easy teaming distance of the loop and makes delivery when material is needed.

Havemeyer Products, Bar-Tys, Bar-Spacers, Ty-Chairs, Beam-Saddles, Etc., keep the steel in its right place while the concrete is being poured.

*Try Our Service*

## CONCRETE STEEL CO.

MONADNOCK BLDG. CHICAGO

# INVESTIGATION AND EXPERIENCE ARE PROVING THE RELIABILITY OF HYDRATED LIME

## FOR WATER PROOFING AND TO FACILITATE POURING CONCRETE

In these 51 concrete storage tanks, recently erected in Cedar Rapids, Iowa, by the Quaker Oats Co., there are approximately 12,500 cubic yards of concrete—1-2-4 mix. The walls are perfect cylinders, with no lips or bulged surfaces.

Hydrated lime was used for waterproofing and also to facilitate pouring the concrete and lifting the forms, owing to its lubricating properties. In mixing, 25 pounds of hydrated lime was put into each batch, which made the percentage of lime to cement a little over 8% by weight. The mixers used were of such size that three bags of cement could be used in each batch.

Considerable credit is given by the Leonard Construction Co. of Chicago to the lime. The statement is made that the lime gave the exterior surface a white and uniform appearance, and that the surface needed no subsequent coating. There were no joints where the concrete stuck to the forms and "lifted," as it does in many cases where the concrete is not of uniform mixture.

***Write any of the following competing manufacturers of Hydrated Lime for complete information about Hydrated Lime in Concrete***

**Marblehead Lime Co.,** Chicago—Kansas City
**Port Byron Lime Assn.,** Port Byron, Ill.
**Lee Lime Co.,** Lee, Mass.
**Glencoe Lime & Cement Co.,** St. Louis, Mo.
**Hunkins-Willis Lime & Cement Co.,** St. Louis, Mo.
**Riverton Lime Co.,** Riverton, Va.
**Ste Genevieve Lime Co.,** St. Louis, Mo.
**Palmer Lime & Cement Co.,** 103 Park Ave., New York, N. Y.
**Rockland & Rockport Lime Co.,** New York—Rockland, Maine—Boston
**The A. & C. Lime Co.,** Canton, Ohio
**O. C. Barber Allied Industries Co.,** Canton, Ohio
**Kelley Island Lime & Transport Co.,** Cleveland, Ohio
**National Lime & Stone Co.,** Carey, Ohio
**Ohio Hydrate & Supply Co.,** Woodville, Ohio
**Union Lime Co.,** Milwaukee, Wis.
**John D. Owens & Son Co.,** Owens, Ohio.
**Woodville Lime Products Co.,** Toledo, Ohio
**Merion Lime & Stone Co.,** Norristown, Pa.
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FOR SALE

## NEW LOCOMOTIVE CRANE

One Link-Belt 20-ton, 8-wheel, 50-ft. boom, 1½-yd. clam shell bucket. M.C.B. Immediate shipment. New in July, 1918.

## 50-TON LOCOMOTIVE

American Locomotive Co. 4 wheel, saddle tank, standard gauge air brakes. New in July, 1918.

## DUMP CARS

Four 12 yard Western wheel scraper hand dump cars. M.C.B. condition.

*Located at Benton Coal Company Mine, Benton, Ill.*

Write, BENTON COAL CO., 709 Fisher Bldg., Chicago.

## Machinery Bargains

### Rock Drills

6 3⅝″ Murphy, nearly new
1 3½″ Murphy, nearly new
1 3¼″ Murphy, nearly new
2 3″ Murphy, nearly new
23 Victor Jackhammer Drills, new

### Compressors

2,000 cu. ft. Rand and 50 others

### Boilers

2 300 H.P. Wickes Water Tubes
1 400 H.P. Wickes Water Tube
50 other boilers

***Largest Machinery House in America***

**Wickes Machinery Co.**
Jersey City, N. J.

## STEAM SHOVEL

Marion Model No. 20 with 1 1-4 yard dipper as good as new. Can make immediate shipment.

**CALUMET IRON & METAL CO.**
327 S. La Salle St., Chicago, Ill.

## USED MOTORS

**For immediate Delivery—Overhauled and Guaranteed—Largest Stock in America to Choose From. For Sale: 3 Phase, 60 Cycle, 220 V.**

| H.P. | | Speed |
|---|---|---|
| 1— 3 | —General Electric | 1800 |
| 1— 3 | —Westinghouse | 1200 |
| 1— 5 | —Wagner | 1800 |
| 1— 5 | —Allis Chalmers | 1200 |
| 1— 7½ | —General Electric | 1800 |
| 1—10 | —Westinghouse | 900 |
| 2—15 | —Westinghouse, Type CCL | 1750 |
| 2—15 | —Watson, slip-ring, var. speed | 1720 |
| 1—15 | —Fairbanks-Morse | 1200 |
| 1—15 | —General Electric, Form L | 1200 |
| 1—15 | —General Electric | 1200 |
| 3—15 | —Fairbanks-Morse, slip-ring, constant speed | 1200 |
| 1—15 | —Westinghouse, vertical | 1135 |
| 2—15 | —Allis-Chalmers | 1130 |
| 2—15 | —Allis-Chalmers | 860 |
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| 4—20 | —Westinghouse | 1750 |
| 1—20 | —General Electric | 1200 |

Send for MONTHLY BARGAIN SHEET Showing Complete Stock and Net Prices.

**GREGORY ELECTRIC CO.**
16TH AND LINCOLN ST
CHICAGO, ILLINOIS

Capital and Surplus, $500,000.00

## LOCOMOTIVE CRANES
## STEAM SHOVELS
## LOCOMOTIVES
## CARS
## RAILS
## HOISTING ENGINES
## GRAB BUCKETS
## STONE CRUSHERS
## COMPRESSORS
## ETC.

Try us for honest value in dependable "used" material of this character. We'll treat you right.

**Wm. B. Grimshaw Co.**
1052 Drexel Bldg., Phila., Pa.
Dealers in "Used" but "Not Abused" Machinery

## For Sale

BUCYRUS SHOVEL

Standard, Electric, 60-ton, with 2½ cubic yard dipper; capacity 250 cubic yards per hour, fully equipped with electric motors and automatic control throughout; operates with 2,200 volt or 440 volt; 3 phase, 60 cycle current; mounted on standard 8-wheel M.C.B. trucks. PRICE $25,000 f. o. b. cars in California. All in first-class working order, ready for immediate delivery.

Also, one

INSLEY DRAGLINE EXCAVATOR

with 2 one-half yard buckets operating, one going up, one down, over a fabricated steel framework of sufficient height for loading into cars or trucks, together with 56 h.p. distillate motor, double drum hoist, etc., original cost about $5,000.
PRICE $3,000 f. o. b. cars in California.

Also, one

WESTINGHOUSE 30 H.P. MOTOR

60 cycles; 3 phase; 2,200 volts; 850 R.P.M. with auto starter. In fine condition.

WILLIAM H. FORD
704 Market St.
San Francisco

## Practically New Equipment For Sale

18-24 in. gauge 3-deck steel cars and 1 transfer for handling cement block or hollow wear; 1 "Blake model" 9-in. x 15-in. Jaw Crusher; 12 tons 16-lb. steel T rails; 1 "Excelsior" hand tamp; 10 cement brick machine.

**C. H. Horton Co.**
PAINESVILLE, O.

*New and Second Hand Bargains*

## CARLIN'S

SHEARS DERRICKS
GRINDING PANS
ELECTRIC HOISTS
BUCKETS

*Same location for 69 years*

JOHN H. CARLIN MACHINE CO.
140 Lacock St., N. S., Pittsburgh, Pa.

# First Aid to Contractors

**That is the very name to apply to the**

**IMPERIAL WELDING CUTTING EQUIPMENT**
**OXY-ACETYLENE PROCESS**

in this case, where it is literally worth its weight in gold.

THESE MEN are putting in a new lip on one of the six 110-ton steam shovels in a quarry of the Brownell Improvement Company's rock crushing plant —largest in the world. To remove the teeth and lip requires the removal of one to two hundred rivets. In spite of the best construction and most careful handling, a job like this has to be performed on the average twice a season on each dipper.

In this work and repairing other machinery about the plant, Imperial torches are used exclusively. They save the time of men, decrease the periods of idleness of the shovels and help to keep the plant up to its enormous daily output of over 150 carloads a day.

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1—2-cylinder 6x6 belt driven Gardner-Rix, capacity, 80 ft. per minute.
2—Ingersoll-Sergeant Class A, 18 x 8¼ x 24 Straight Line, steam-driven, 650 ft. per minute at 100 lb.
1—Rand Duplex, steam-driven, 600 ft. capacity with receiver.

### BOILERS

4—50-hp. locomotive type.
4—Vertical tubular. 1—12-hp. 1—15-hp. 1—20-hp.

### CABLEWAY

1—Lambert, 6-ton, 900-ft. span.

### CENTRIFUGAL PUMPS

1—18-in. Morris direct connected to double vertical steam engine.
1—10-in. Buffalo, double suction, belt driven.
1—15-in. Buffalo, belt driven.
1—20-in., belt-driven Worthington Turbine.

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20—3-yd. Peteler, 36-in. gage.
20 pairs of wheels and axles, for 4-yd. Western, extra heavy, brand new.

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100—McKiernan-Terry "Wizard" Rock Drills, 2¼ to 3-in., with tripods for air or steam, all brand new.

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1—Worthington Duplex Fire Pump, 18½x9¼ x10, capacity 610 gallons per minute.

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2—Ransome, 1-yd. on skids, with steam engine, but no boiler.

### HOISTING ENGINES

1—10x12 Lidgerwood compound geared to drum 41x52-in. Has 25-ton pull. Suitable for mine work.
2—American, 7x10, double cyl., 2 drum, with boom swinger, but without boiler.
2—7x10 American D. C. D. D., with swingers and boilers.

**Locomotives, Drills, Pumps, Steam Shovels, Etc.**

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### STEAM SHOVELS

1—95-C Bucyrus, shop No. 1304.
4—70-C Bucyrus, shop Nos. 1552, 1298, 1287, 1126, 2½-yd. dippers.
1—Standard 70-ton Bucyrus, shop No. 733, 2½-yd. dipper.
1—45-C Bucyrus, shop No. 1202; 1¾-yd. dipper.

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1—Model 28 Marion, ⅝-yd. dipper; shop No. 2988. Has moved 80,000 yd. Good as new; immediate shipment.
1—0 Thew traction shovel, shop No. 1002, ⅝-yd. dipper.

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2—No. 2 Monighan steam-operated all-steel draglines, 60-ft. booms, one 2-yd. and one 1½-yd. Page bucket, mounted on skids and rollers.
3—Class 24 Bucyrus Steam Drag Lines on skids and rollers; 100-ft. boom, 3½-yd. bucket. Shop Nos. 763, 764, 772. Built new in 1913 and 1914. As good as new; immediate shipment.

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25—16-yd. standard gage Western air dump cars, with steel lined floors.
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2—12-yd. standard gage Oliver side dump cars.
9—6-yd. standard gage K. & J. side dump cars.
60—4-yd., 36-in. gage Western.
30—1½-yd., 24-in. gage.

### LOCOMOTIVES

1—18x24 cylinder, 10-wheel locomotive, weighing 55 tons, with 42 tons on drivers; built by American Locomotive Co. in 1907; steam pressure 170 lb., rigid wheel base, 10 ft. 2 in., wheel centers 44 in. in diameter. Most modern locomotive receiving general overhauling.
1—18x24, 10-wheel Baldwin, weighing 54 tons, with 42 tons on drivers; steam pressure 180 lb., diameter of driving wheel centers 50 in., rigid wheel base 13 ft. 10 in., overhauled Oct., 1917. First-class condition.
2—Standard gage 10x16 Davenport Saddle tank locomotives, weighing 19 tons, 1 65 lb. steam pressure, steam brakes and automatic couplers; locomotives built in 1917. Good as new.
2—Standard gage Davenport Saddle Tank Locomotives, weighing 18 tons, 150 lb. steam pressure, steam brakes and automatic couplers.
10—36-in. gage, 10x16 and 9x14 Davenport saddle tank locomotives.

### RAIL, SWITCHES, SPIKES, ETC.

1—Carload 4½-in., 5-in. and 5½-in. spikes.
10 tons angle bars for 70-lb. and 75-lb. rail.
10 tons 20-lb. rail with splices.
40 tons 52-lb. rail.

### SHOP EQUIPMENT

3—Brownell, 72 in. x 18 ft. Horizontal Tubular Boilers, with 4-in. tubes.
2—20 x 22¼ x 14¼ x 21 AA2 Ingersoll-Rand Compressors, complete with fittings.
1—20 x 22¼ x 15¼ x 21 AA1 Ingersoll-Rand Compressor.
1—66 x 18 Vertical air receiver, complete.
1—30 x 6 Vertical air receiver, complete.
1—16 x 16 x 18-in. Laidlaw-Dunn-Gordon Air Compressor with reservoir, weight 15,000.
1—Stationary Engine; horizontal center crank type; 10 x 12 in. cylinder, slide valve type; 25 hp.

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An experienced master mechanic who has had charge of crushing, grinding, screening and burning machinery similar to that used in the manufacture of cement. Address, with experience and salary expected, Box W. W. W., care Cement & Engineering News, 672 Transportation Building, Chicago, Ill.

### CHIEF ENGINEER WANTED.

Wanted, for large cement plant, chief engineer familiar with Corliss engines and all power house equipment. Must have thorough knowledge of stokers and combustion of fuel. Please state age, position in draft, previous experience, references and salary expected in first letter. Address Box 69, care Cement & Engineering News, 672 Transportation Building, Chicago.

### SUPERINTENDENT WANTED.

For wet process Cement Mill in Middle West, by January 1, 1919. Must be competent mechanic and engineer, capable of taking full charge of 2,000-barrel mill. In replying, state fully—age, experience, reference, where last, or at present, employed, and salary expected. Address Box 22, c/o Cement and Engineering News, 672 Transportation Bldg., Chicago, Ill.

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With fifteen years' experience, the last twelve as chief chemist, desires position. Address Quimico, c/o Cement and Engineering News, 672 Transportation Bldg., Chicago, Ill.

### CHEMIST WANTED.

Competent cement chemist wanted to take charge of laboratory; advise age, experience, reference and salary considered. Address Box 22, care Cement & Engineering News, Chicago, Ill.

Wanted: Complete second-hand cement plant, machine shop and laboratory outfit; must be in first-class condition. Address R. C. C., care of Cement & Engineering News, 672 Transportation Bldg., Chicago.

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Wanted—Superintendent or assistant superintendent who has had cement mill and quarry experience, to take charge of a large lime and stone crushing plant. Must be a hustler and good practical man, able to handle several hundred men. Splendid opening for the right man, with an excellent future. Man with cement mill experience preferred. State fully previous experience, reason for desiring change, and salary expected. Apply Box J. B., care Cement & Engineering News, 672 Transportation Building, Chicago.

## WANTED

**Superintendent for Cement Plant. Located in Lehigh Valley; 2,000 bbls. daily capacity. Must be available Jan. 1st or before. Write fully, giving experience, references, age and salary expected. Address C-C-H. c/o Cement & Engineering News, 672 Transportation Bldg., Chicago, Illinois.**

### COMPRESSORS

| | Price |
|---|---|
| 1—12x12 Laidlaw-Dunn Gordon, belt driven, capacity 300' | $ 750 |
| 1—12x12x16 Ingersoll, straight line, steam driven, capacity about 300' at 80 to 100 lb | 600 |
| 1—Sullivan, 2 stage air, simple steam, capacity 1800' at 80 to 100 lb | 2,500 |
| 2—14x12 Bury Duplex, belt driven, capacity about 550' at 60 to 80 lb., each | 1,000 |
| 1—14x16x10x16 Sullivan, 2 stage air, simple steam, capacity 600' at 80 to 100 lb | 1,500 |
| 1—14x9x10 Bury, 2 stage, belt driven, capacity 350' | 1,500 |
| 1—Ingersoll-Rand Imperial Type XB2, 500' | 2,000 |
| 1—Sullivan 2 stage, belt driven, 1400' good as new, f. o. b. St. Louis | 4,500 |

### CARS

| | |
|---|---|
| 20—4 yd. Western, 2 way, contractors, 36" gauge, wooden bodies, each | $ 125 |
| 70—2½ yd. steel bodied, end dump quarry cars, 36" gauge, each | 80 |
| 30—2½ yd. steel bodied, end dump quarry cars, 48" gauge, each | 75 |
| 20—12 yd. Western, standard gauge MCB, air dump cars, almost new, each | 1,050 |
| 20—12 yd. Western, standard gauge MCB, air dump cars, good condition, each | 900 |
| 50—1½ yd. Koppel "V"-shaped, 24" gauge, steel cars, new, each | 120 |

### CRUSHERS

| | |
|---|---|
| 1—No. 9 Style "K," almost new | $7,000 |
| 2—No. 5 Austins, one straight and one angle drive, both fine condition, each | 1,500 |
| 1—No. 6 Style "D" Gates, fine condition | 2,000 |
| 1—No. 7½ Austin, almost new | 2,500 |
| 1—10x20 Blake jaw crusher on skids | 800 |
| 1—9x16 Good Roads Machinery, jaw crusher on wheels, with 22' elevator. | 800 |
| 1—9x16 Universal on skids, almost new. | 500 |
| 1—No. 7½ McCully | 3,000 |
| 1—No. 5 McCully | 1,500 |

### ELEVATOR AND SCREENS

| | |
|---|---|
| 1—No. 5 Gates 70' centers, almost new. | $ 700 |
| 1—No. 7½ Austin 62' centers, fine condition | 900 |
| 1—No. 9 with 36" buckets, good condition, without belt | 900 |
| 1—Stephens & Adamson stone screen, 42"x16', with dust jacket, practically new | 700 |
| 1—48x18 Austin screen with dust jacket | 800 |
| 1—48x20 McCully screen with dust jacket | 900 |

### CLAM SHELL BUCKETS

| | |
|---|---|
| 1—¾ yd. Owen with teeth, almost new | $450 |
| 1—1½ yd. Hayward, first class | 650 |
| 1—1 yd. Browning | 500 |
| 1—1½ yd. Page Dragline | 500 |

### CRANES

| | |
|---|---|
| 1—7 ton, 4 wheel Vulcan Bucyrus single line crane | $ 6,000 |
| 1—10-ton Browning 4 wheeled, with bucket | 7,000 |
| 1—15 ton Brown hoist, with 50' boom, 8 wheeled MCB, with 2 yd. Brown hoist, clamshell | 17,500 |
| 1—20 ton Brown hoist, 8 wheel MCB, 50' boom, and bucket | 18,000 |
| 1—25 ton Browning hoist, 8 wheel MCB, 50' boom, and bucket | 21,000 |

### HOISTING ENGINE

| | |
|---|---|
| 1—6¼x10 American DCDD, with boiler. | $1,000 |
| 1—7x10 Lidgerwood DCDD, with boiler | 1,100 |
| 1—7x10 Lambert, 3 drum, with boiler | 1,600 |
| 1—8x12 Mundy DCDD, with boiler | 1,300 |
| 1—9x10 Lidgerwood, 3 drum, 32" drums, without boiler | 1,900 |
| With boiler | 2,300 |
| 1—Clyde 9x10, 3 drum with boiler, f. o. b. Mich. | 2,500 |
| 1—5x8 DCDD Reversible O&S, with vertical engine, without boiler | 350 |
| With boiler | 550 |
| 1—7x10 Lambert DCDD, with boiler | 1,100 |

### LOCOMOTIVES

| | |
|---|---|
| 1—9x14 Vulcan, 36" gauge, saddle tank. | $1,250 |
| 1—9x14 Vulcan 36" gauge, saddle tank. | 1,350 |
| 1—10x16 Vulcan 36" gauge, saddle tank. | 1,600 |
| 1—10x16 American 36" gauge, saddle tank, good as new | 1,850 |
| 1—19x24 Baldwin, 10 wheeler, 60 tons. | 8,000 |
| 1—18x24 American, 10 wheeler | 5,000 |
| 1—17x24 6 wheel switcher | 5,000 |
| 1—14x24 Pittsburgh, saddle tank standard gauge with separate tender | 4,000 |

### DRAGLINES

| | |
|---|---|
| 1—Monighan-Walker steam machine, with 50' boom, 1½ yd. bucket, almost new | $7,000 |
| 1—Flory outfit engine 10x12 heavy dragline type boiler, fire box 150 lb. pressure, boom 60', steel bucket, 2 yd. New 1917 | 9,000 |
| 1—24 Bucyrus, with 85' boom | |

### RAIL

| | Price |
|---|---|
| 400 tons—35 lb., with angle bars | $57 |
| 1500 tons—56 lb., with angle bars | 58 |
| 100 tons—75 lb., with angle bars | 55 |

### PUMPS

| | |
|---|---|
| 1—10" Morris, sand, belt drive | $ 500 |
| 1—8" Morris, water, belt drive | 300 |
| 1—20x10x14 Worthington duplex | 600 |
| 1—Wilson-Snyder water works pump, complete with condenser | 2,000 |

### STEAM SHOVELS

| | |
|---|---|
| 1—No. 0 Thew on standard gauge railroad truck, ⅝ yd. dipper | $2,500 |
| 1—No. 0 Thew traction with ⅝ yd. dipper, fine condition | 4,000 |
| 1—14B Bucyrus traction with ⅝ yd. dipper, almost new | 4,000 |
| 1—18B Osgood traction with ¾ yd. dipper, high boom, one year old | 5,000 |
| 1—No. 1 Vulcan revolving shovel, standard gauge with ¾ yd. dipper, good as new | 4,500 |
| Same as above, with 35' crane boom | 5,500 |
| 1—45 ton Bucyrus, standard gauge, 1¾ yd. dipper | 6,500 |
| 1—Model 60 Marion with 2½ yd. dipper | 7,000 |
| 1—65 ton Bucyrus with 2½-yd. dipper | 5,000 |

### CABLEWAYS

| | |
|---|---|
| 1—9x10 Lidgerwood, 3 drum engine and boiler and carriage and part of other fittings, no rope | $3,000 |
| 1—50 hp. Flory DD electric with carriage and fittings, but no rope | 3,000 |
| 1—7x10 Flory steam DCDD with boiler, carriage and all fittings, but no rope | 1,950 |

### BOILERS

| | |
|---|---|
| 1—25 hp. vertical American hoist and derrick | $250 |
| 1—40 hp. firebox on steel truck | 550 |
| 1—50 hp. vertical butt strap | 750 |
| 1—60 hp. vertical Lidgerwood | 800 |

### MOTORS

| | |
|---|---|
| 1—20 hp. Westinghouse, 60 cycle, 3 phase, 220 volt | $400 |
| 1—30 hp. Westinghouse, 60 cycle 3 phase, 2200 volt | 450 |
| 1—35 hp. Westinghouse, 60 cycle 3 phase, 2200 volt | 500 |
| 1—50 hp. General Electric, 60 cycle 3 phase, 220 volt | 750 |

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